MONTANA WATER SUPPLY REPORT 2016

Prepared for:
The Honorable Governor Steve Bullock

By:
Governor's Drought Advisory Committee
DNRC Water Management Bureau
Water Resources Division

The Montana Department of Natural Resources & Conservation

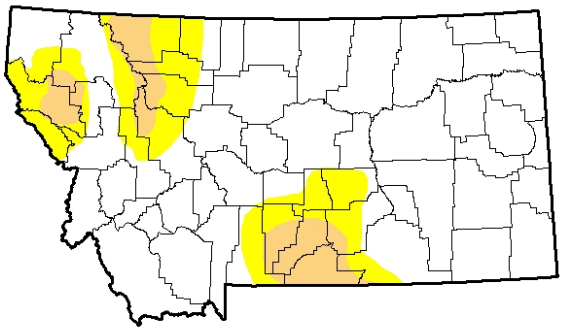
TABLE OF CONTENTS

EXECUTIVE SUMMARY

The *Montana Water Supply Report 2016* provides a compilation of data from various agencies relating to current water supply conditions that may affect Montana during the coming months. This report can be used to determine water availability for Water Year 2016 (October 1, 2015 through September 30, 2016) in terms of reservoir storage, streamflow, soil moisture, agricultural production, and climatic conditions. In addition, this report provides an overview of resources available to communities facing drought or near-drought conditions. This report fulfills the statutory mandate set forth in MCA § 2-15-3308(5)(a-d) to, "submit a report to the governor describing the potential for drought or flooding in the coming year."

Drought Potential

According to the U.S. Drought Monitor (see map below), at this time, the potential for impacts from drought on surface water supplies dependent on spring snowmelt runoff from mountain snowpack through July is generally limited with the exception of certain regions where surface water levels are low for the second year in a row. **The Northern Rocky Mountain Front, southwest Flathead County, Sanders County, Mineral County, Carbon and Stillwater Counties, western Big Horn and Yellowstone Counties, and parts of Sweet Grass, Park, Golden Valley, and Musselshell Counties** are all ***abnormally dry to moderate drought***. These areas should be monitored for impacts from drought to uses such as dryland farming and livestock production, hydropower production, fisheries health, recreation, tourism, and residential use.



U.S. Drought Monitor

Montana

April 26, 2016

(Released Thursday, Apr. 28, 2016)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	78.13	21.87	7.87	0.00	0.00	0.00
Last Week 4/19/2016	74.43	25.57	7.87	0.81	0.00	0.00
3 Months Ago 1/26/2016	47.92	52.08	29.73	14.46	3.54	0.00
Start of Calendar Year 12/29/2015	48.55	51.45	30.93	20.95	3.54	0.00
Start of Water Year 9/29/2015	30.55	69.45	38.18	28.78	16.92	0.00
One Year Ago 4/28/2015	85.06	14.94	2.90	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

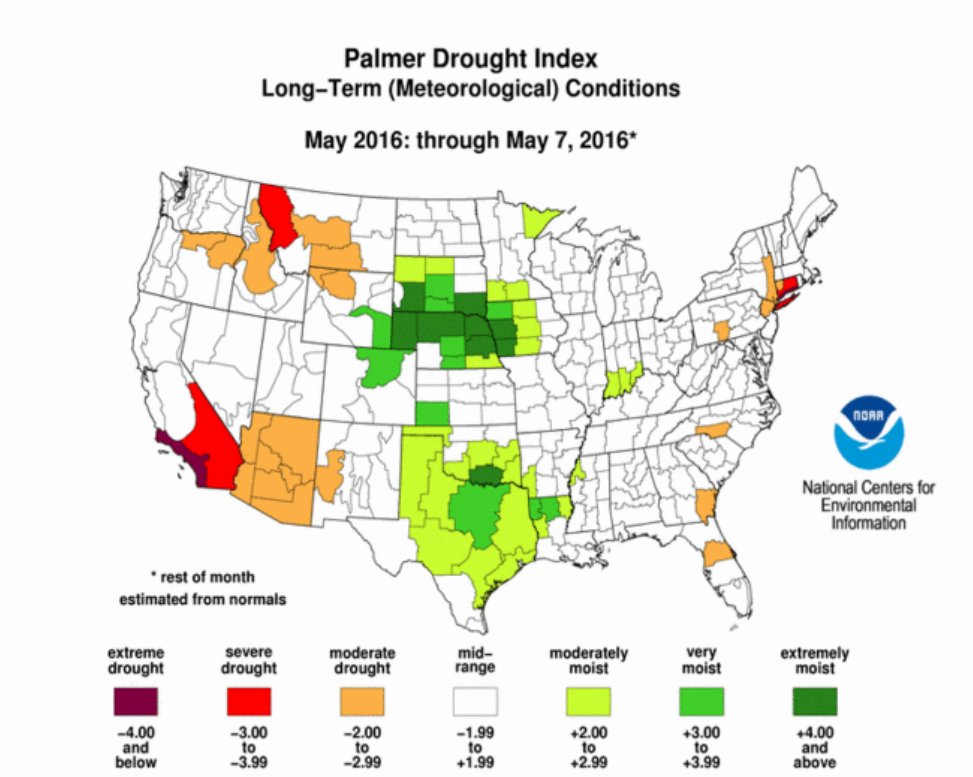
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/

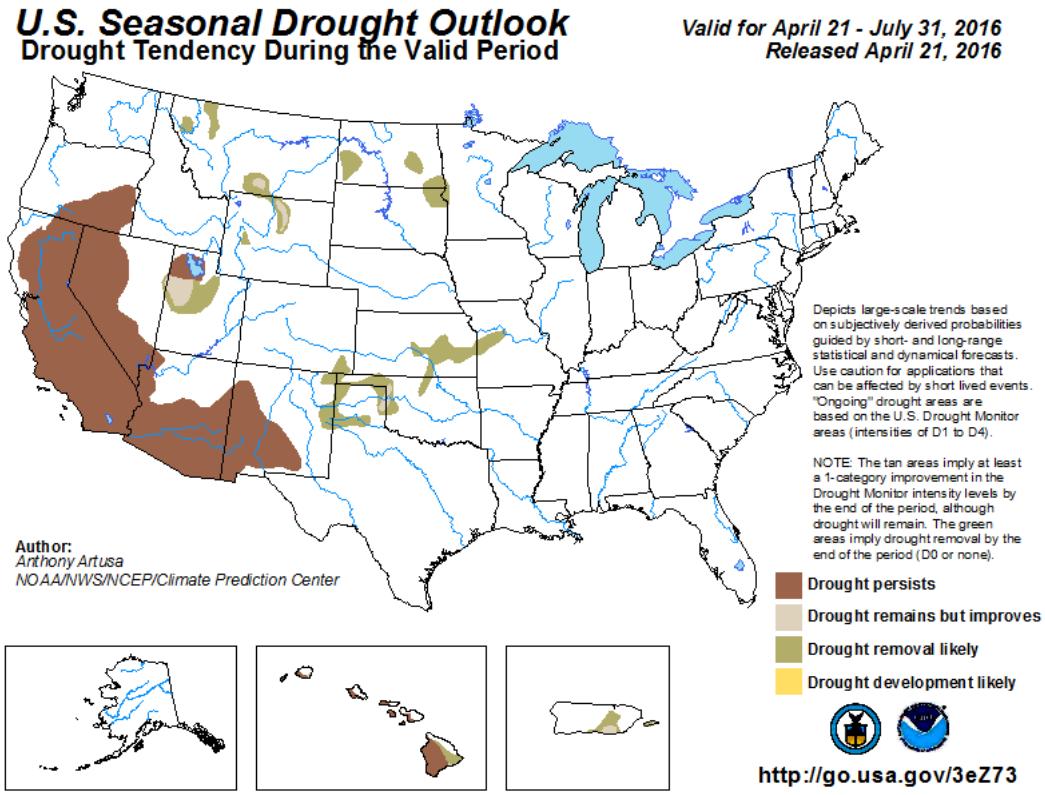
Source: US Drought Monitor, Montana, May 5, 2016:
http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?MT

The Palmer Drought Hydrological Index (PDHI) is an index generated by National Oceanic and Atmospheric Association (NOAA) and used as an assessment of hydrological conditions from 1900 to 2016 (see map below). Montana is listed for extreme drought in the western portion of the state and moderate drought for the north and south central portions of the state.



Source: NOAA, National Centers for Environmental Information, Weekly Palmer Drought Indices, Weekly Maps, May 7, 2016: http://www.ncdc.noaa.gov/temp-and-precip/drought/weekly-palmers/20160507

However, the U.S. Drought Outlook indicates that improvement is likely for all areas of the state currently suffering from dry conditions (see map below). The latest seasonal assessment indicates that, “For the upcoming May-June-July (MJJ) season, drought persistence is forecast for most areas west of the Continental Divide.” (NOAA, April 2016). However, east of the Divide, precipitation outlooks up to 90-days in the future favor a wet pattern and could even result in a one-category improvement in drought conditions. (NOAA, April 2016).



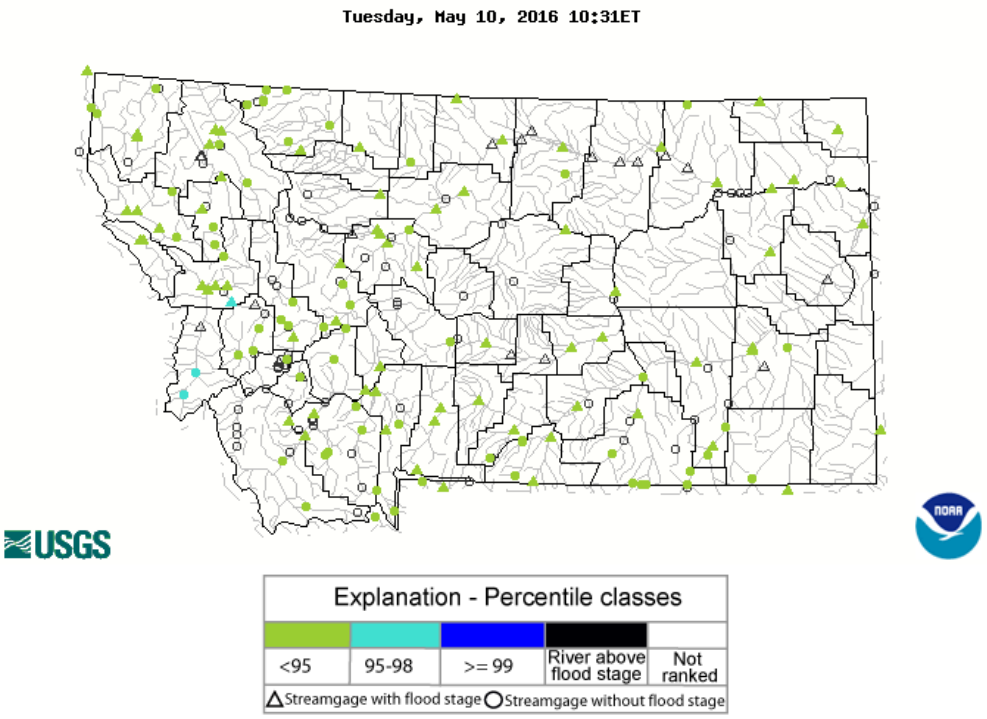
Source: National Weather Service, Climate Prediction Center, U.S. Seasonal Drought Outlook, valid April 21-July 31, 2016: http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php

See:

- US Drought Monitor: http://droughtmonitor.unl.edu/
- US Drought Monitor Classification Scheme: http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx
- NOAA Historical Palmer Drought Indices, Animations of Monthly Maps from 1900-2016: http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/phdiimage.html
- USGS, Map of below normal 7-day average streamflow compared to historical streamflow for the day of year: http://waterwatch.usgs.gov/index.php?id=wwdrought2
- National Integrated Drought Information System (NIDIS) Map and Data Viewer: http://gis.ncdc.noaa.gov/map/drought/US.html#app=cdo
- National Weather Service (NWS) Great Falls State Office, Semi-monthly drought report summarizing weather and precipitation for 21 cities and towns**,** current and archived: http://www.wrh.noaa.gov/tfx/climate/droughtsum/droughtsum.php?wfo=tfx
- NWS, Climate Prediction Center, US Drought Seasonal Outlook: http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php

Flood Potential

According to the United State Geological Survey (USGS), which measures streamflow across the United States, the potential for high flow conditions due to runoff from high elevation snowpack in Montana is ***low***. All USGS stream gages in Montana read below the 98th percentile, and the majority read below the 95th percentile. This means the estimated streamflow is less than the 98th percentile for all days of the year.



Source: USGS, WaterWatch, Map of flood and high flow condition (Montana), Tuesday, May 10, 2016: http://waterwatch.usgs.gov/?m=flood&r=mt&w=real,map

See:

- USGS, Water Watch: http://waterwatch.usgs.gov/index.php
- National Weather Service - Advanced Hydrologic Prediction System for flooding information: http://water.weather.gov/ahps/
- Map of real-time streamflow compared to historical streamflow for the day of the year (Montana): http://waterwatch.usgs.gov/index.php?m=real&r=mt&w=map

Mountain Snowpack and Temperatures

According to the Natural Resources and Conservation Service (NRCS), after a moderate winter that left rivers well below average in most locations, the month of March provided much needed snowpack increases across the state. (NRCS, April 2016). West of the Divide all basins except the Upper Clark Fork (-1%) improved and are only slightly below normal for snow water equivalent at this time. East of the Divide the southwest and central portions of the state are at or near average snowpack, but the north central river basins continue to report a well-below average snowpack. (NRCS, April 2016).

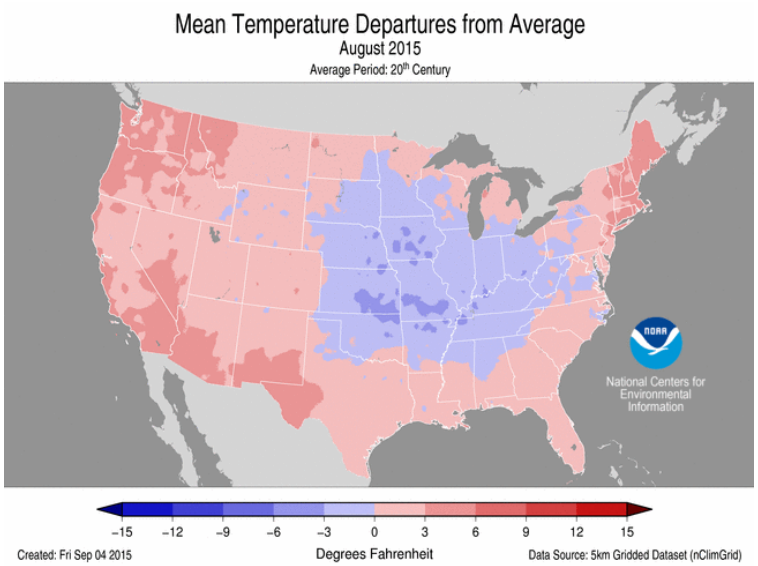
According to the NRCS as of May 1, 2016, warm temperatures experienced under high pressure ridging between storm systems caused the low elevation snowpack to melt off earlier than usual and mid elevation snowpack is following the same trend.

See:

- Up-to-date precipitation totals from the National Weather Service: http://www.wrh.noaa.gov/tfx/dx.php?wfo=tfx&type=&loc=products&fx=PCPNTOTALS

Antecedent Conditions

According to NOAA, Water Year 2015 ended with low soil moisture, reservoir storage, streamflow, and precipitation. Water Year 2015 was characterized by above-normal temperatures and below-normal precipitation. (NOAA, Sept. 2015). By May 1, 2015, there was a similar trend to this year of well below normal snowfall and well above average temperatures causing mid and high elevation sites to melt out leaving a historically low snowpack in some locations at that time. (NRCS, Sept. 2015). The mean temperature departures from average for Montana and much of the western U.S. ranged from 3-9 degrees Fahrenheit warmer than average (see map below). By the beginning of September 2015, 30.4% of the U.S. was in drought, an increase of 3.3% in just two months. (NCDC, Sept. 2015).



Source: NOAA, National Centers for Environmental Information, National Overview, August Mean Temperature Departures from Average (August 2015): https://www.ncdc.noaa.gov/monitoring-content/sotc/national/2015/aug/grid/temp/tave-anom-201508.gif

Water Year 2015 was marked by an especially severe wildfire season. The National Interagency Fire Center reported 2.4 million acres burned throughout the month of August alone, the majority of which were located in Washington, Oregon, Idaho and Montana. (NOAA 2015). Unless precipitation continues and temperatures remain low, Water Year 2016 may lead to a wildfire outlook equally influenced by warmer-than-average temperatures in the Pacific Northwest coinciding with drought conditions ranging from severe to extreme. (NOAA 2015).

See:

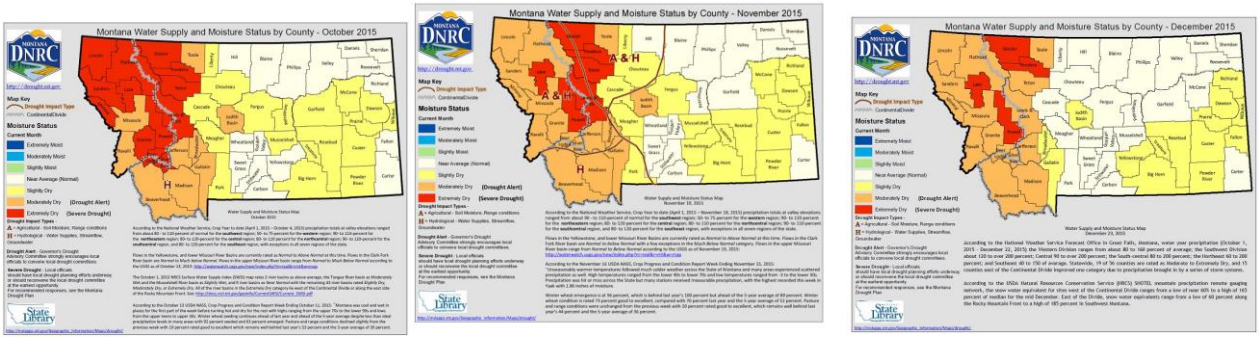
- NOAA, National Overview – August 2015: https://www.ncdc.noaa.gov/sotc/national/201508

WATER SUPPLY AND MOISTURE CONDITIONS

Montana Water Supply and Moisture Status by County

The Montana Governor's Drought and Water Supply Advisory Committee performs a monthly assessment of drought conditions by county on a year-round basis. A group of experts from the National Weather Service (NWS), United States Department of Agriculture's (USDA) National Agriculture Statistics Service (NASS) and Natural Resources and Conservation Service (NRCS), and the Montana Bureau of Mines and Geology (MBMG)/Groundwater Information Center (GWIC) assess conditions for each county consulting a variety of moisture and water supply data products. Information is obtained from real-time monitoring systems in the mountains to streamflow and reservoir gaging systems, as well as soil moisture reports from county extension agents, producers, and other state and federal government field offices (see maps below). A gap in creating the county drought maps occurred from January 2016 – April 2016. The group of experts tasked with creating these maps is working to create the missing maps with the most accurate information possible. The maps are anticipated to be available by the end of May 2016.

The first part of Water Year 2016 (October – December) are available and show that the northwest and western part of the state was consistently extremely to moderately dry for the first three months of the water year. The central and eastern portions of the state were only slightly dry to near average.



Source: Montana.gov Official Website, Montana State Library, Geographic Information, Montana County Drought Status Maps, October – December, 2015: http://mslapps.mt.gov/geographic_information/maps/drought/

A more complete picture of Water Year 2016 will be available once the months of January 2016 – April 2016 are mapped. The three available maps show that Montana entered the winter months, historically known to be when the state receives the majority of its snowfall, with very dry conditions. The winter months of 2016 were moderate and temperatures were some of the warmest in Montana's history. It is likely that soil moisture was negatively impacted.

See:

- Montana Water Supply and Moisture Status by County maps: http://drought.mt.gov/default.aspx

Surface Water Supply Index (SWSI)

The NRCS generates the Surface Water Supply Index (SWSI) as a projection of surface water availability for 54 Montana river basins based on mountain snowpack, mountain precipitation,

streamflow, soil moisture, and reservoir storage (see map below). The SWSI is best applied to valley areas with surface water supplies that are dependent primarily upon spring runoff from high elevation mountain snowpack.

According to the NRCS, the May 1, 2016, SWSI map shows moderate to extremely dry conditions for available surface water supplies in the following rivers and creeks:

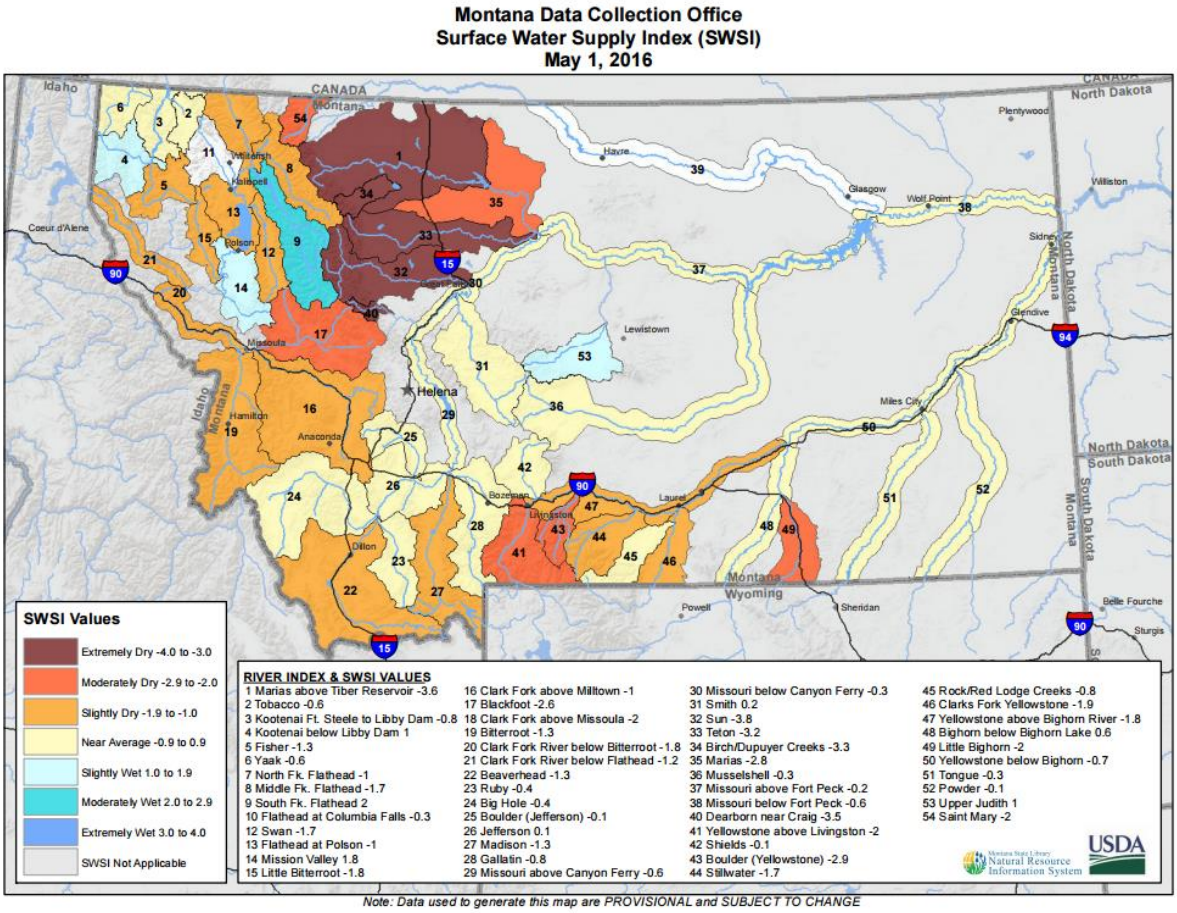
- Marias
- Teton
- Sun
- Birch/Dupuyer
- Dearborn near Craig
- Blackfoot
- Yellowstone above Livingston
- Boulder (Yellowstone)
- Tongue River
- Little Bighorn

The following rivers and creeks showed slightly dry conditions:

- Middle and North Forks of the Flathead
- Flathead at Polson
- Swan
- Little Bitterroot
- Fisher
- Clark Fork below the Flathead
- Clark Fork below the Bitterroot
- Bitterroot
- Clark Fork above Milltown
- Beaverhead
- Madison
- Yellowstone above Bighorn River
- Stillwater
- Clarks Fork of the Yellowstone

In general, the majority of the state is near average or slightly dry according to the SWSI, but that is qualified by what precipitation the rest of May and June will bring. All surface water supplies for the state should continue to be monitored, given the reduced mid- elevation snowpack and overall low moisture content of soils as a result of Water Year 2015 and mild 2016 winter.

The April 1st 2016 NRCS Water Supply Outlook Report noted, “Well above average temperatures during the month of March, and well below normal snowfall has caused all basins to decline below normal for April 1st, 2015. Low to mid-elevations experienced significant melt during the month, while higher elevations have continued to hold on to the abundant snow received earlier in the year. Basin declines have caused streamflow prospects to drop for this spring and summer during the April through July time period.” (NRCS, April 2016). The May 1st 2016 NRCS Water Supply Outlook Report states, “periods of record warmth under high pressure caused substantial melt at many snow measurement locations during the month, which resulted in decreases in snowpack percentages ranging from 5 to 34 percent across the state.” (NRCS, May 2016).



Source: Montana.Gov Official State Website, Montana State Library, Geographic Information, NRCS Snow and Water Supply (May 1, 2016): http://mslapps.mt.gov/Geographic_Information/Maps/watersupply/

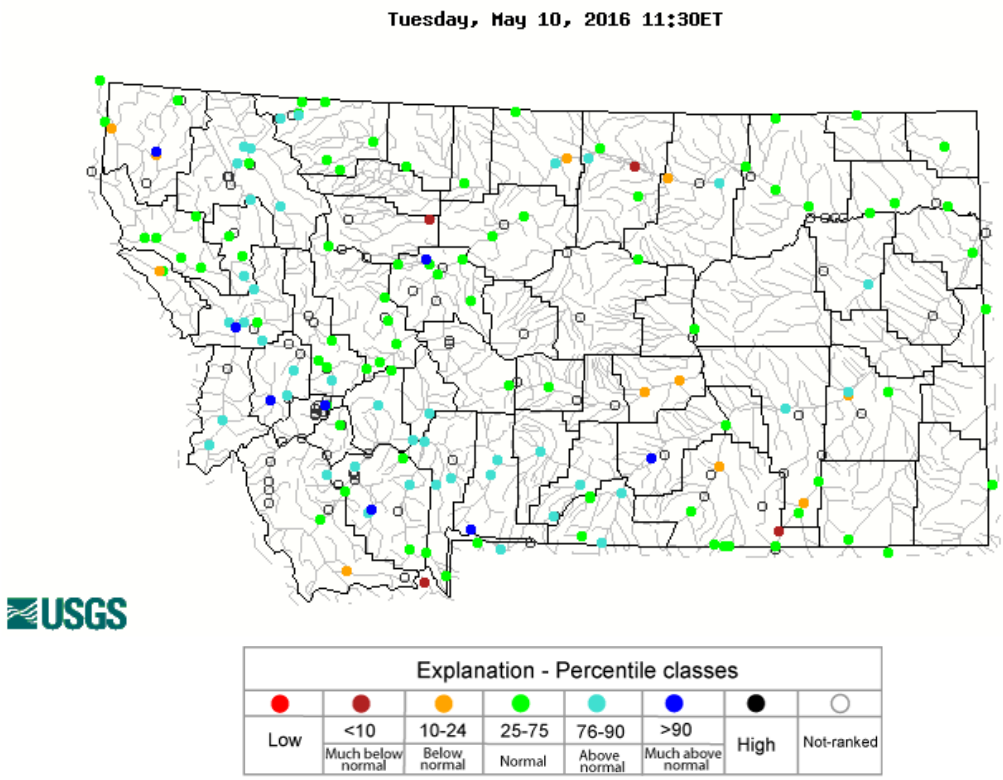
See:

- USDA, NRCS, Basin Outlook Reports, Montana Water Supply Outlook Reports: http://www.nrcs.usda.gov/wps/portal/nrcs/main/mt/snow/waterproducts/basin/
- Current SWSI data: http://docs.msl.mt.gov/geoinfo/CurrentSWSI/Current_SWSI.pdf
- SWSI map archive: http://nris.mt.gov/NRCS/swsi/Monthly.asp

Streamflow

According to the USGS, as of May 9, 2016, the streamflow gages for the state tell a similar story to the SWSI. Streamflows are generally normal or above normal with a few areas where flows are below or much below normal (see map below). The areas where currently streamflows are **much below normal** are:

- Teton River below Dutton (32% of normal median)
- Milk River near Harlem (30% of normal median)
- Tongue River near Decker, MT (22% of normal median)
- Henry's Fork near Lake Idaho (5% of normal median)



Source: USGS, WaterWatch, Map of real-time streamflow compared to historical streamflow for the day of the year (Montana) (Tuesday, May 10, 2016): http://waterwatch.usgs.gov/?m=real&r=mt

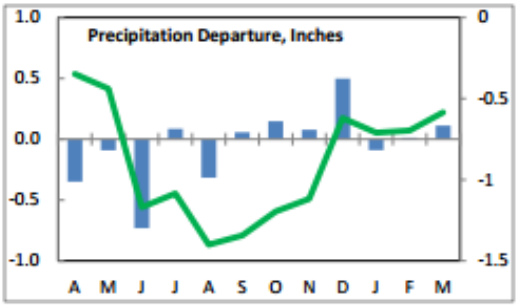
See:

- USGS, Current Conditions for Montana: Streamflow – 230 gaging sites (real-time): http://waterdata.usgs.gov/mt/nwis/current/?type=flow
- USGS Water Watch, real-time streamflow and statistics: http://waterwatch.usgs.gov/?m=real&r=mt
- USGS Water Watch, interactive current streamflow conditions: http://waterwatch.usgs.gov/new/?m=flood&r=mt&w=real,map
- NRCS Stream Flow Forecasts, April 1, 2016: http://www.wcc.nrcs.usda.gov/ftpref/support/water/westwide/forecast_table/wy2016/fcst1604.html
- The NRCS Peak Streamflow Dates Forecast Table: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/snow/?cid=nrcs144p2_057801
- USGS Water Watch: http://waterwatch.usgs.gov/?m=real&r=mt
- USGS Flood Watch: http://wy-mt.water.usgs.gov/floodwatch/index.html

Precipitation

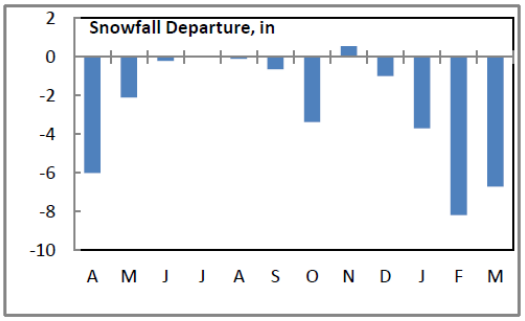
According to the National Weather Service (NWS), Montana experienced variable departures from normal precipitation amounts across the state, though statewide, March averages were around 0.11 inches above normal (see chart below). The north central through eastern portions of the

state were generally below normal, while the west and south central parts of the state were above normal. The highest amount recorded was 11.10-inches at Poorman Creek SNOTEL (Lincoln).



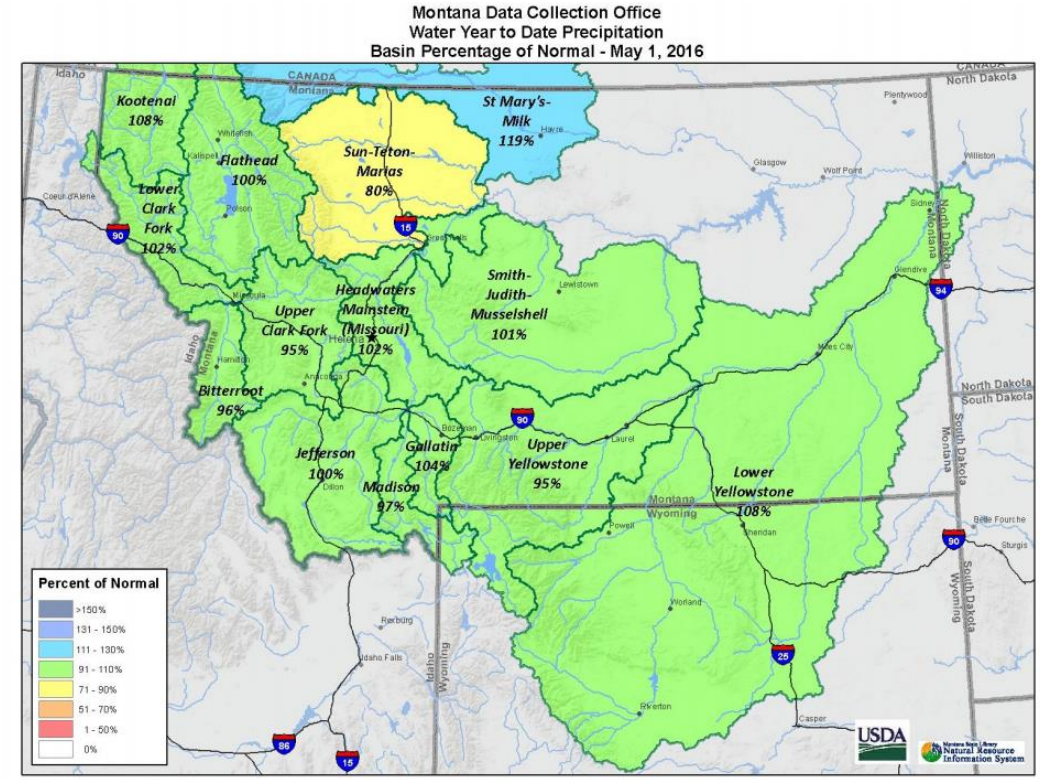
Source: NOAA's NWS, Great Falls Montana: Montana Weather/Precipitation Summary (March 2016): http://www.wrh.noaa.gov/tfx/climate/droughtsum/pdfs/montanawx_2016_03.pdf

The NWS, reported that, "The winter's trend of lighter than normal snowfall continued in March. The monthly composite was 4.2-inches, or 6.7-inches below normal (figure [below]). This was the 14th lightest March snowfall of record. March 2015's average was only 2.4-inches. Over the past 12-months, the snowfall composite is about one-half the normal amount. Only one of the past 12 have had above normal snowfall." (NWS, March 2016) (see chart below).



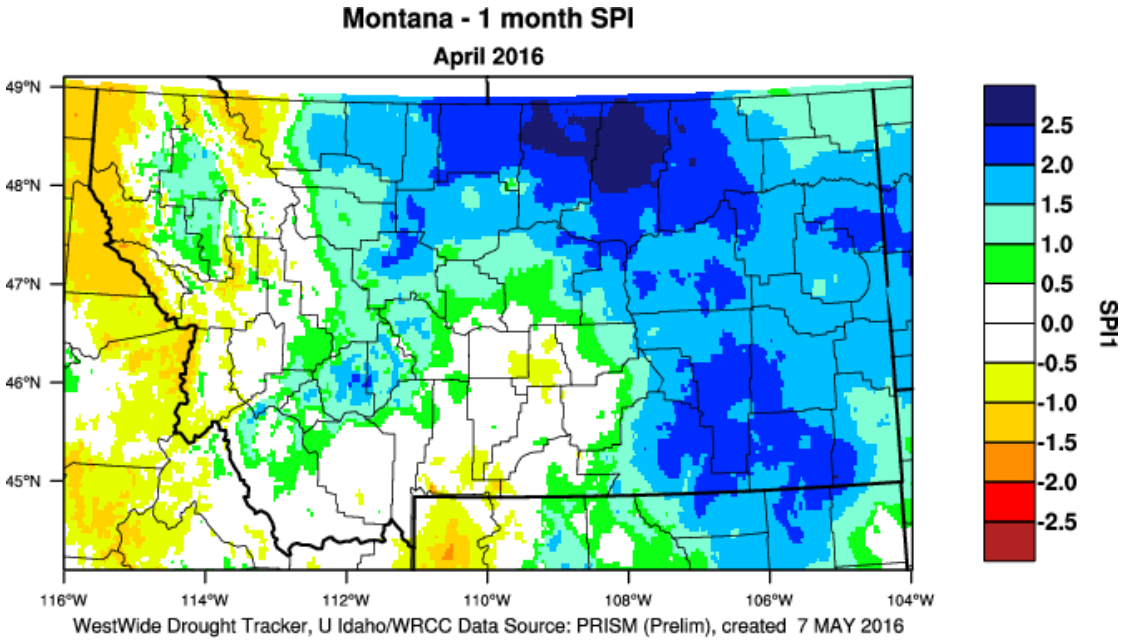
Source: NOAA's NWS, Great Falls Montana: Montana Weather/Precipitation Summary (March 2016): http://www.wrh.noaa.gov/tfx/climate/droughtsum/pdfs/montanawx_2016_03.pdf

According to the NRCS Water Supply Outlook Report for May 2016, precipitation patterns were characterized by "periods of high pressure (sunny and above average temperatures) followed by unsettled weather and some precipitation and cooling" throughout the winter and spring (NRCS, May 2016). Furthermore, "Mountain SNOTEL locations west of the Divide received 56% to 82% of average precipitation during the month of April. East of the Divide mountain SNOTEL sites received 75% to 172% of average precipitation. Valley locations generally received more precipitation than the mountains percentage wise over the month" (NRCS, May 2016) (see map below).



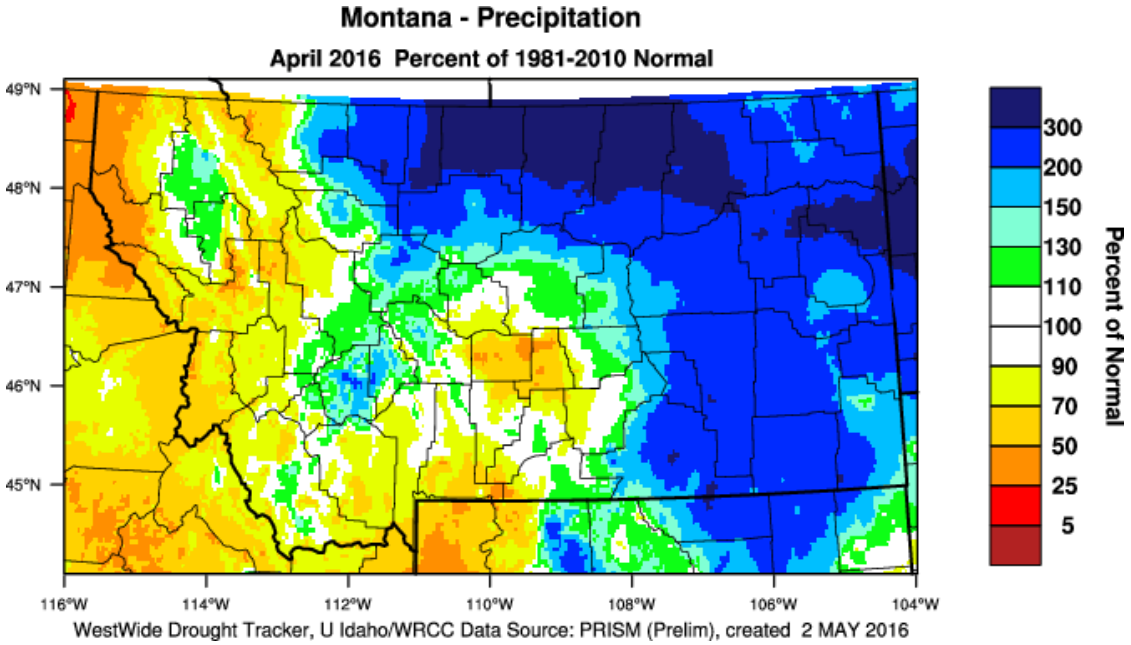
Source: NRCS, Montana Water Supply Outlook Report, May 1st, 2016 (Zukiewicz): file:///C:/Users/cna130/Downloads/WSOR_May2016_Web%20(2).pdf

April 2016 precipitation for Montana was characterized by normal to slightly below normal levels of precipitation for the western and southcentral parts of the state, and normal to much above normal levels for the Highline and eastern and especially southeastern portions of the state (see map below).



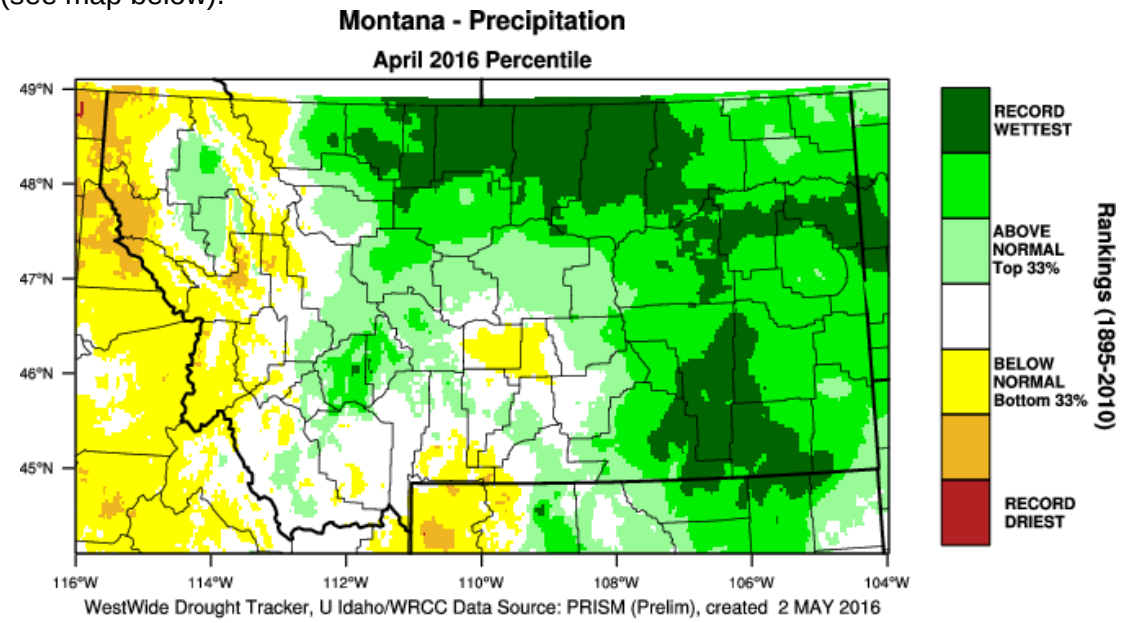
Source: WestWide Drought Tracker, PRISM dataset, Montana – 1 month SPI, April 2016: http://www.wrcc.dri.edu/wwdt/current.php?folder=spi1

The trend in precipitation patterns is even more pronounced when compared to data from 1981-2010, where precipiation levels are measured by a percent of normal when compared to all data points for the 30 year period of measurements. The April 2016 map generated shows areas in the west and southcentral receiving 70-90% of normal precipitation and the Highline and eastern parts of the state receiving 200-300% of normal precipitation (see map below).



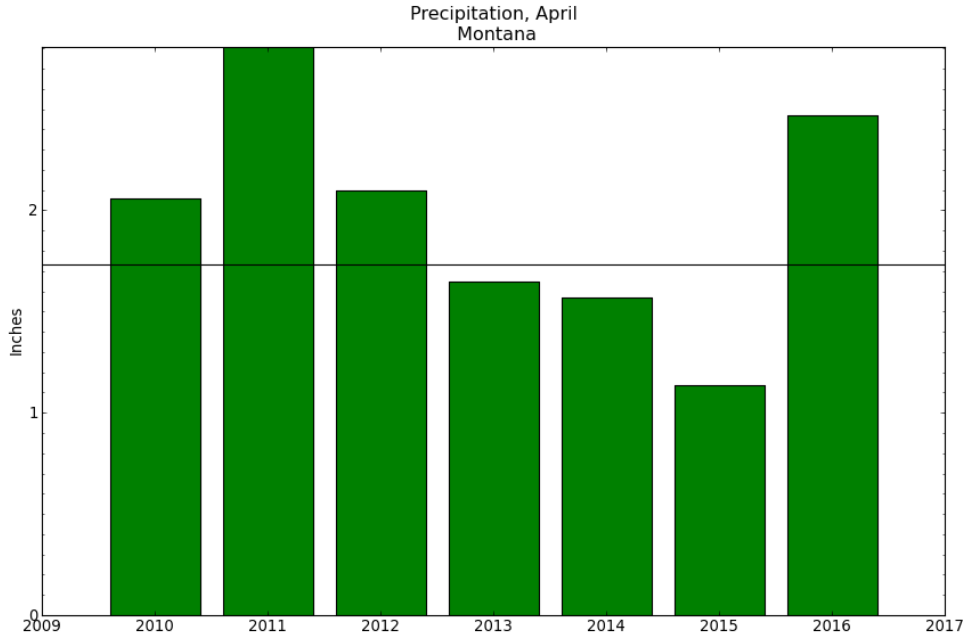
Source: WestWide Drought Tracker, PRISM dataset, Montana – Precipitation, April 2016 Percet of 1981-2010 Normal: http://www.wrcc.dri.edu/wwdt/current.php?ds=PRISM

April 2016 was one of the wettest on record for parts of the northcentral and eastern areas of the state (see map below).



Source: WestWide Drought Tracker, PRISM dataset, Montana – Precipitation, April 2016 Percentile: http://www.wrcc.dri.edu/wwdt/current.php?folder=pon1per

April 2016 provided just over twice as much precipitation as April 2015 (see chart below).



Source: WestWide Drought Tracker, Precipitation April Montana, Time Series 2009-2016, 1-month time span: http://www.wrcc.dri.edu/wwdt/time/

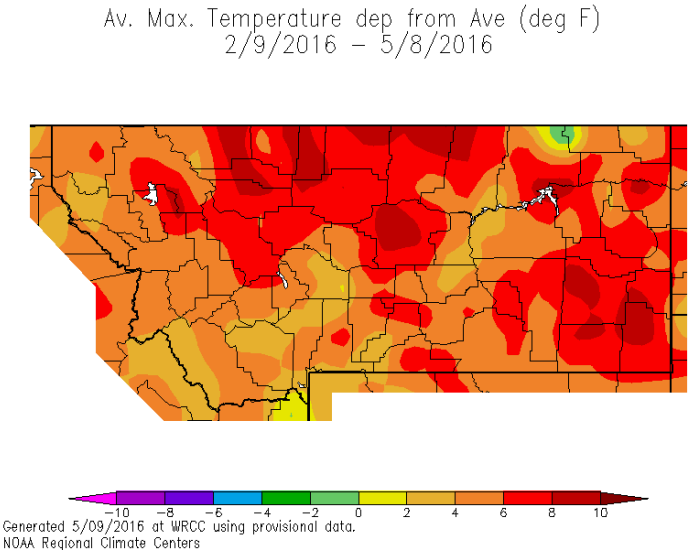
May and June are the state's two highest precipitation months. Historically it was expected about 2.5 inches of precipitation from each month would be added at valley elevations. "Mountain precipitation continues to provide moist conditions at high elevations." Montana Climate Atlas (Caprio & Nielsen 1992). Recent changes to climate patterns may impact this assessment. For those seeking to track daily changes, NOAA's Western Regional Climate Center generates daily temperature and precipitation anomaly maps and tables showing departures from, and percentages of average.

See:

- University of Idaho, West Wide Drought Tracker: http://www.wrcc.dri.edu/wwdt/current.php?folder=spi3&region=ww
- NOAA, Western Regional Climate Center, Climate Anomaly Maps and Tables: http://www.wrcc.dri.edu/anom/mon_anom.html
- NWS, Forecast Office, Great Falls, MT, Semi-Monthly Drought Summaries: http://www.wrh.noaa.gov/tfx/climate/droughtsum/droughtsum.php?wfo=tfx
- NWS, Climate Prediction Center, "Discussion for the Seasonal Drought Outlook": http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_discussion.php
- NWS, Current statewide precipitation totals: http://www.wrh.noaa.gov/tfx/dx.php?wfo=tfx&type=&loc=products&fx=PCPNTOTALS
- NWS, Montana Weather/Precipitation Summary: http://www.wrh.noaa.gov/tfx/climate/droughtsum/pdfs/montanawx_2016_03.pdf
- NRCS, Montana Water Supply Outlook Report May 1, 2016: file:///C:/Users/cna130/Downloads/WSOR_May2016_Web.pdf

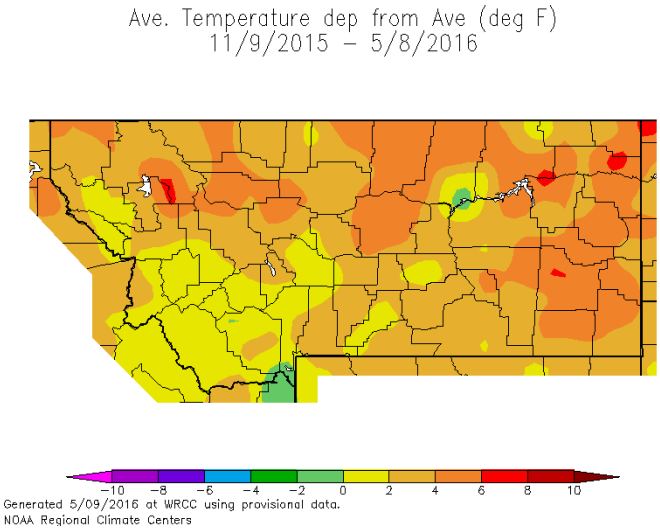
Temperature

According to NOAA, 2016 was the warmest winter on record for the U.S. and the 3rd warmest for Montana. February alone was the warmest on record for Montana. (NOAA, March 2016) (see map below).



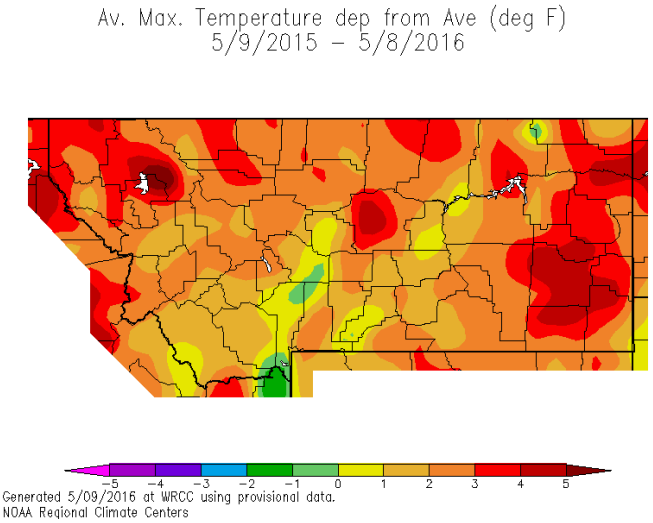
Source: NOAA, Western Region Climate Center, Climate Anomaly Maps and Tables, Montana, Average Maximum Temperature Departure from Average, Past 3 Months (Most recent 90 days): http://www.wrcc.dri.edu/cgi-bin/anomimage.pl?mon90dTxdep.gif

The six-month departure from average temperatures for Montana illustrates the daily high temperatures across the state over the past 6-months. The six-month departure from average temperatures for 2016 mimics what was seen in 2015. The continued pattern of above average daily high temperatures for the state is an indication that there is a strong potential for dry conditions.



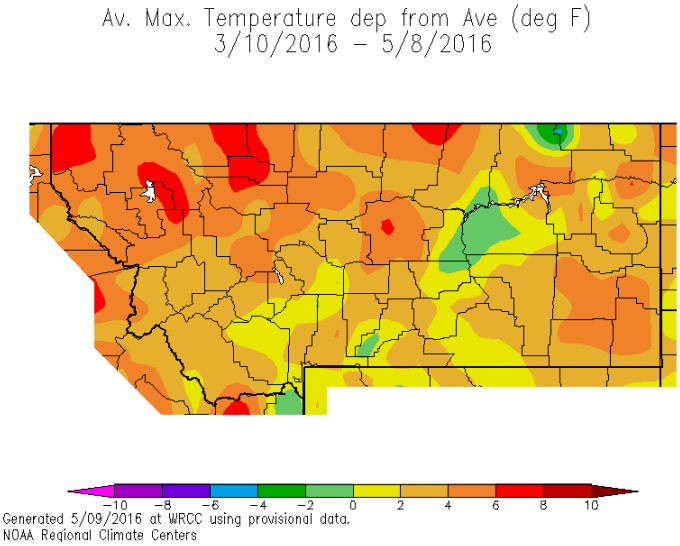
Source: NOAA, Western Region Climate Center, Climate Anomaly Maps and Tables, Montana, Average Temperature Departure from Average, Past ½ Year (Most recent 6 Months): http://www.wrcc.dri.edu/cgi-bin/anomimage.pl?mon6mTvdep.gif

Water Year 2016 to date has seen maximum average temperatures departing from the average by 1-5°F higher for the majority of the state, with the eastern portion of the state seeing the warmest temperature departures for the last year (see map below). Pockets of the southcentral part of the state are near average to 1°F above.



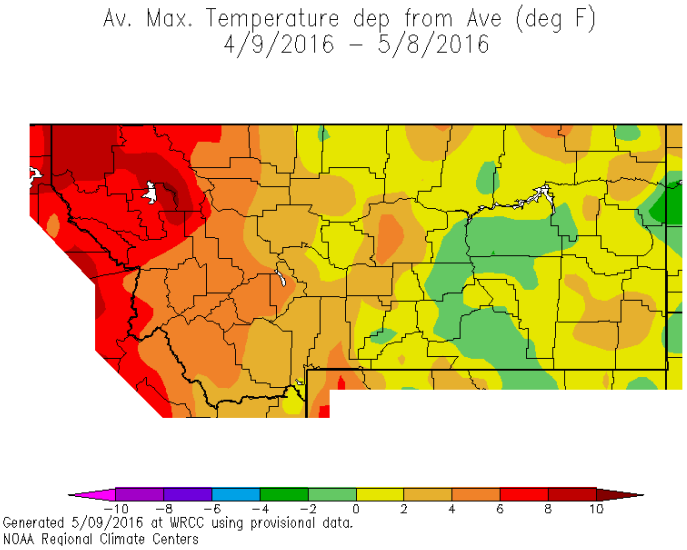
Source: NOAA, Western Region Climate Center, Climate Anomaly Maps and Tables, Montana, Average Maximum Temperature Departure from Average for the last year (Most recent 12 Months): http://www.wrcc.dri.edu/cgi-bin/anomimage.pl?mon12mTxdep.gif

Despite recent rainfall and decreased temperatures, the last two months tell a similar story. The sixty-day departure from average daily high temperatures illustrates the continued above average daily temperatures across the state (see map below).



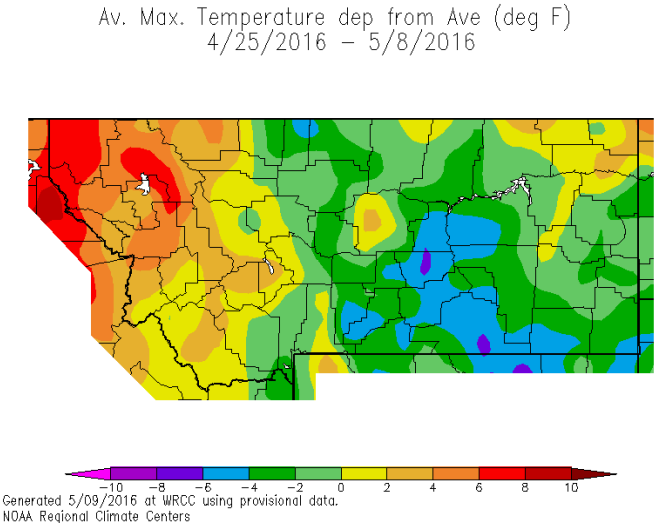
Source: NOAA, Western Region Climate Center, Climate Anomaly Maps and Tables, Montana, Average Maximum Temperature Departure from Average for the last two months (Most recent 60 days): http://www.wrcc.dri.edu/cgi-bin/anomimage.pl?mon60dTxdep.gif

Thirty-day high temperature departure from average reveals some of the moderation seen over the course of the past month in the eastern half of Montana. Cooler conditions helped prevent what could have been a higher loss of soil moisture had the previous warming trend continued unabated. Compared to the same data at this time last year, conditions were similar, though not as warm and 2 to 4 degrees cooler in the central and eastern portions of the state (see map below).



Source: NOAA, Western Region Climate Center, Climate Anomaly Maps and Tables, Montana, Average Maximum Temperature Departure from Average for the last month (Most recent 30 days): http://www.wrcc.dri.edu/cgi-bin/anomimage.pl?mon30dTxdep.gif

Despite increased precipitation and decreased temperatures, the two week temperature departure from average does not show a significant shift from recent anomalously warm temperatures (see map below). April 2016 ranks as the 12th warmest since 1987, with 1915 holding the record for warmest April, based on data collected since 1895 by NOAA (see chart below).



Source: NOAA, Western Region Climate Center, Climate Anomaly Maps and Tables, Montana, Average Maximum Temperature Departure from Average for the last month (Most recent 30 days): http://www.wrcc.dri.edu/cgi-bin/anomimage.pl?mon14dTxdep.gif

Montana Average Temperature Rankings, April 2016

« March 2016

Record Coolest	Bottom 1/10	Bottom 1/3	Normal	Top 1/3	Top 1/10	Record Warmest

More information on Climatological Rankings

Download: XML

PERIOD	AVG TEMP	20TH CENTURY AVERAGE	DEPARTURE	RANK	WARMEST/COOLEST SINCE	RECORD
Apr 2016 1-month period	45.1°F (7.3°C)	40.7°F (4.8°C)	4.4°F (2.5°C)	111th Coolest	Coolest since: 2015	1975
				12th Warmest	Warmest since: 1987	1915
	Ties: 1969					

Source: NOAA, National Centers for Environmental Information, Climatological Rankings, Montana Average Temperature Rankings, April 2016: http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/index.php?periods%5B%5D=1&parameter=tavg&state=24&div=0&month=4&year=2016#ranks-form

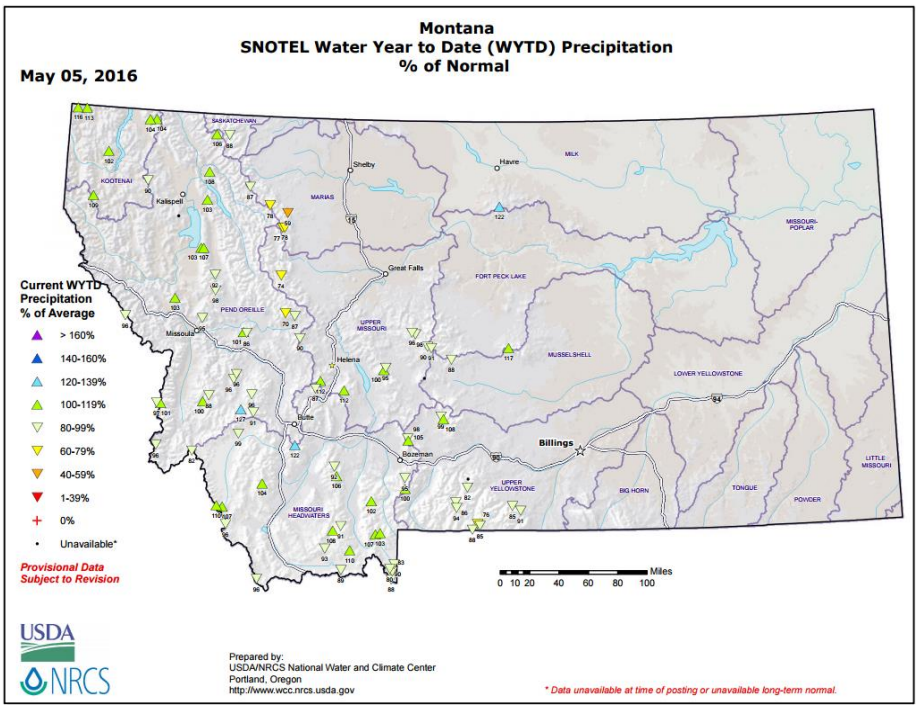
See:

- NOAA Western Region Climate Center, Climate Anomaly Maps and Tables: http://www.wrcc.dri.edu/anom/mon_anom.html
- NOAA National Climatic Data Center, State Annual and Seasonal Time Series: http://www.ncdc.noaa.gov/temp-and-precip/state-temps/
- NOAA National Centers for Environmental Information, Climatological Rankings: http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/index.php?periods%5B%5D=1&parameter=tavg&state=24&div=0&month=4&year=2016#ranks-form

Mountain Precipitation

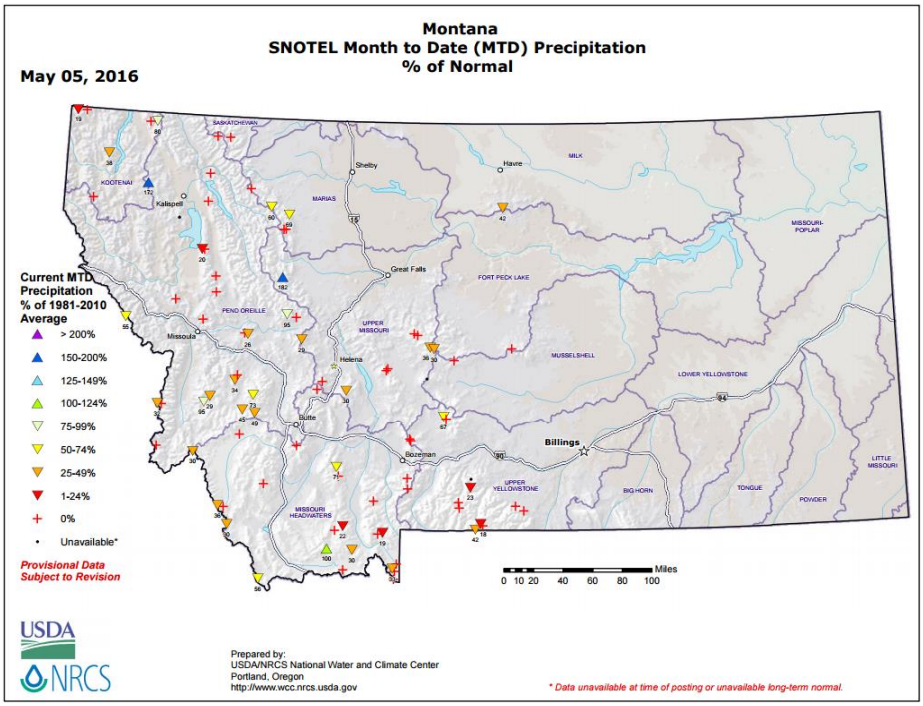
According to the NRCS, nearly 80 percent of annual streamflow in Montana originates as snowfall that accumulates high in the mountains during fall, winter, and spring. Aquifers, lakes, streams, and reservoirs are largely dependent on runoff from mountain snowpack. As the snowpack accumulates, hydrologists are able to forecast the runoff that occurs when it melts, and in turn, the streamflow expected in the months that follow. NRCS data for the current period of record, 1981-2010 indicate that the peak of snow water equivalent (SWE) of the snowpack occurs around April 15 each year.

The SNOTEL sites for the Water Year to Date (WYTD) for 2016 indicate that precipitation is, on the whole, at or just below normal, with two exceptions (see map below). The Northern Rocky Mountain Front has precipitation levels of generally 60-40% below average. The Big Hole Valley, on the other hand, has precipitation levels for the WYTD of 122% above average.



Source: Montana.Gov Official State Website, Montana State Library, Geographic Information, NRCS Snow and Water Supply (May 1, 2016): http://mslapps.mt.gov/Geographic_Information/Maps/watersupply/

The last month of data tell a different story, though, with mountain precipitation levels generally 25-49% of average normal, for the time period of 1981-2010 (see map below).



Source: Montana.Gov Official State Website, Montana State Library, Geographic Information, NRCS Snow and Water Supply (May 1, 2016): http://mslapps.mt.gov/Geographic_Information/Maps/watersupply/

See:

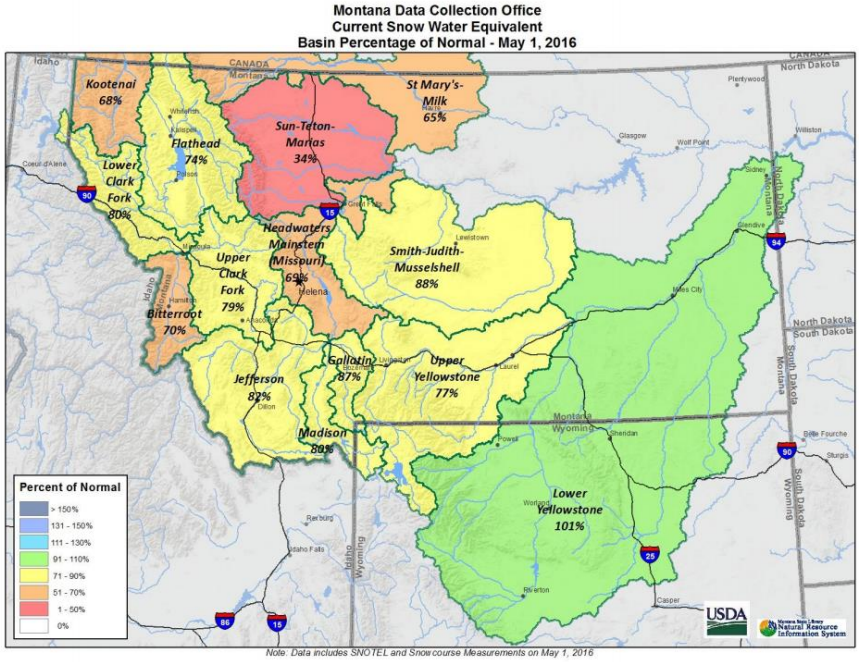
- NRCS Snow Survey Data & Analysis: http://www.mt.nrcs.usda.gov/snow/data/
- NRCS, Current Water Year Data: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/snow/products/?cid=nrcs144p2_057794

Snowpack

Several periods of unusually high daily temperatures over the course of March and April accelerated melting of low and mid-elevation mountain snowpack, according to the Natural Resources Conservation Service (NRCS) *May 1st Montana Water Supply Basin Outlook Report*: Despite increased precipitation in April, snowfall in the basins was not abundant and only marginal increases in SWE occurred west of the Continental Divide (see map below). Areas east of the Divide received more snowfall, but with limited increases to SWE measurements. The Lower Yellowstone is one exception where "abundant moisture from a few closed lows… impacted the sub-basins." (NRCS, May 2016). Furthermore, peak SWE occurred early this year, from one to two weeks west of the Divide and up to four weeks early at high elevation sites east of the Divide. The NRCS Basin Outlook Report noted that, "On a positive note, peak snow water this year exceeded last year in all basins except for the Sun-Teton-Marias. Unfortunately, the warm temperatures caused melt and the movement of water ahead of schedule in almost all of the basins." (NRCS, May 2016).

Due to record early runoff, the availability of slow release snow water later in the spring and summer will be compromised. The NRCS Basin Outlook Report summarized as follows:

> This year has been extremely dry in the Rocky Mountain Front and water users should be prepared for well below average streamflows due to the lack of mountain snowpack. Basin-wide snowpack in the basin i[s] the lowest for this date in the last 35 years, and water users will be dependent on reservoir storage and spring and summer precipitation to augment streamflows.



Source: Montana.Gov Official State Website, Montana State Library, Geographic Information, NRCS Snow and Water Supply (May 1, 2016): http://mslapps.mt.gov/Geographic_Information/Maps/watersupply/

The following table summarizes water year mountain precipitation from the NRCS Snotel automated network as of May 1, 2016, for the major river basins of the state. The peak of water content of the snowpack occurs historically around April 15. This Water Year however, snowpack below 6,000 ft. elevation melted due to unseasonably warm temperatures during March and April.

Snow Water Equivalent (SWE) figures indicate the water content of the snowpack at a particular site on that date as a percent of median. Water-year-to-date or "Total Precipitation" figures show what precipitation has occurred as a percentage of average for the period of record (1981-2010) since October 1, 2015, at Snotel sites whether or not it has melted or remains (as snow) at the site.

Snow Water Equivalent

5/1/2016	*% Normal*	*Monthly Δ*	*% Last Year*
Columbia River Basin	**73**	***-23***	**118**
Kootnenai in Montana	68	*-26*	162
Flathead in Montana	74	*-25*	107
Upper Clark Fork	79	*-16*	116
Bitterroot	70	*-27*	111
Lower Clark Fork	80	*-16*	118
Missouri River Basin	**74**	***-24***	**125**
Jefferson	82	*-29*	124
Madison	80	*-20*	145
Gallatin	87	*-11*	138
Headwaters Mainstem	69	*-34*	113
Smith-Judith-Musselshell	88	*-19*	114
Sun-Teton-Marias	34	*-31*	87
St. Mary-Milk	65	*-5*	141
Yellowstone River Basin	**91**	***-3***	**126**
Upper Yellowstone	77	*-17*	108
Lower Yellowstone	101	*+9*	144
West of Divide	73	*-23*	118
East of Divide	81	*-15*	129
Montana State-Wide	**74**	***-23***	**119**

Source: Montana.Gov Official State Website, Montana State Library, Geographic Information, NRCS Snow and Water Supply (May 1, 2016): http://mslapps.mt.gov/Geographic_Information/Maps/watersupply/

See:

- NRCS, Snow Survey Products: http://www.nrcs.usda.gov/wps/portal/nrcs/main/mt/snow/products/
- NRCS, Current Water Year Data: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/snow/products/data/?cid=nrcs144p2_057794
- NRCS, SNOTEL Update Report: http://www.wcc.nrcs.usda.gov/reports/SelectUpdateReport.html

Reservoir Storage

The most recent data available from the Montana Department of Natural Resources and Conservation (DNRC) and the U.S. Bureau of Reclamation (BOR) indicate that as of April 30, 2016, all reservoir storage levels were at or near average with the exception of North Fork of the Smith River, which is at 77% of average (see DNRC Water Resources Division, State Water Projects Bureau April 30, 2016 report below), and Lake Elwell, which is at 67% of average capacity (see BOR Reservoir Operations Report from May 5, 2016 below).

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

WATER RESOURCES DIVISION - STATE WATER PROJECTS BUREAU

April 30, 2016

All Contents in Acre-Feet

RESERVOIR	TOTAL CAPACITY (includes dead storage)*	CONTENTS							
	Full Pool	AVERAGE	Last Year	Last Month	PRESENT	% CAPACITY	%AVERAGE	READING DATE	COMMENTS
	Contents	1960 - 2014	4/30/2015	3/31/2016	4/30/2016	4/30/2016	4/30/2016		
ACKLEY	6,722	3,678	4,873	4,194	**4,472**	67	122	4/29/2016	elev. =4308.5
BAIR	7,300	5,289	6,370	5,668	**5,445**	75	103	4/18/2016	elev.=5317.34
COONEY	28,230	22,403	23,580	23,480	**25,985**	92	116	4/22/2016	elev.=4248.29 (25,795 AF)
COTTONWOOD	1,900	1,518	1,900	1,805	**1,835**	97	121	4/30/2016	estimated
DEADMAN'S BASIN	75,968	53,666	75,744	63,427	**66,040**	87	123	4/30/2016	elev.=3916 (62,290 AF)
E.F. ROCK CREEK	16,040	9,666	11,868	8,751	**9,451**	59	98	4/30/2016	elev.=6036.8
FRENCHMAN	2,777	2,431	2,777	2,777	**2,777**	100	114	4/30/2016	spilling - assumed. No data reported
MARTINSDALE	23,348	12,124	22,924	15,648	**17,949**	77	148	4/30/2016	elev.=4773.3
MIDDLE CREEK	10,184	6,523	7,501	5,557	**6,946**	68	106	4/30/2016	elev.=6706
NEVADA CREEK	11,207	10,018	11,244	6,496	**9,802**	87	98	5/2/2016	elev.=4612.06
NILAN	10,992	7,138	10,571	8,207	**9,300**	85	130	5/4/2016	elev.=4441.0
N.FK. SMITH RIVER	11,406	8,783	10,399	6,789	**6,789**	60	77	5/2/2016	No data reported
RUBY RIVER	37,612	36,156	37,844	32,900	**38,268**	102	106	5/4/2016	elev.=5393.6
TONGUE RIVER	79,071	51,121	66,537	58,295	**69,747**	88	136	5/2/2016	elev.=3425.6 (69,036 AF)
W.F. BITTERROOT	32,362	20,328	32,362	16,126	**32,362**	100	159	4/27/2016	spilling
WILLOW CREEK	18,000	17,271	16,843	15,560	**18,000**	100	104	5/5/2016	spilling
YELLOWATER	3,842	1,356	3,187	3,171	**3,268**	85	241	4/28/2016	elev.=3117

* Note: Reservoir contents include dead storage at the following:

Ackley	1001 AF	**	Tongue River	711 AF	(O&M storage table includes dead storage)
Cooney	90 AF	**	W. F. Bitterroot	656 AF	(O&M storage table includes dead storage)
Deadman's	3750 AF	**	Willow Creek	269 AF	(O&M storage table includes dead storage)
Nilan	900 AF	**			

** O&M slope storage table does not include dead storage (so dead storage has to be added into the storage from the table)

* Note: Cooney capacity reflects capacity after 1982 dam rehabilitation; prior capacity was 24,195 A.F.. Average storage shown is for post rehabilitation data.
* Note: Middle Creek capacity reflects capacity after 1993 dam rehabilitation; prior capacity was 8,027 A.F.. Average storage shown is for post rehabilitation data.
* Note: Nevada Creek Reservoir Capacity reflects live storage capacity survey conducted in year 2000. Prior live storage capacity documented as 12,723 AF.
* Note: Tongue River capacity reflects capacity after 1999 dam rehabilitation; prior capacity was 68,040 A.F.. Average storage is post rehabilitation data.
* Note: Frenchman Reservoir capacity tables updated based on aerial survey; prior capacity was 3752 A.F. Average shown is pre aerial survey

Source: DNRC, Water Resources Division, State Water Projects Bureau: http://dnrc.mt.gov/divisions/water/projects/docs/reservoir-storage/4-2016_res_contents.pdf.

The BOR reported on May 5, 2016 that:

> All basins except for the Sun-Teton-Marias river basin received above average precipitation. East of the Divide mountain locations were favored over valleys with regards to precipitation. Water year-to-date precipitation across the state increased this month and all basins are near to slightly above average except the Sun-Teton-Marias at 78% of average. Inflows for the month of March ranged from much below average to much above average. Inflows for the month of March ranged from 22 percent of average at Fresno to 126 percent of average at Sherburne.
>
> Over the last month all river basins in the state of Montana have seen an increase in snowpack percentages. East of the Divide the snowpack continues to do well in the southwest and central part of the state, while north central river basins continue to suffer from below normal snowpack. Northern basins east of the Divide in the Front Range snowpack remains near record low. So far the strongest “El Nino” signal this year is the above average temperatures experienced under

high pressure ridging between storm systems. The warm temperatures have caused the low and mid-elevation snowpack to start melting.

Storage in Reclamation reservoirs ranged from below average to much above average for the end of March. Storage content ranged from 88 percent of normal at Gibson to 137 percent of normal at Sherburne. April 1 storage in the Upper Missouri Basin was 2,410,400 acre-feet; 14,900 acre-feet more than the prior month. Storage for the Milk River Project was 166,300 acre-feet; 6,700 acre-feet more than the prior month. Storage in Bighorn Lake in the Bighorn River Basin was 831,000 acre-feet; 23,100 acre-feet less than the prior month.

05-May-16 2:55 PM

BUREAU OF RECLAMATION
MONTANA AREA OFFICE
RESERVOIR OPERATIONS REPORT
05-May-2016
ALL CONTENTS IN ACRE-FEET

				RESERVOIR CONDITIONS							WATER SUPPLY OUTLOOK						
				ELEVATION (FEET)		CAPACITY (ACRE-FEET)		2016			MTN. SNOW WATER CONTENT (INCHES)				APRIL-JULY RUNOFF April 1st FORECAST		
RESERVOIR NAME	NORMAL FULL POOL	TOTAL CAPACITY	AVERAGE CAPACITY	2015	2016	2015	2016	% FULL	% OF AVG	% OF Last Yr	2015	2016	AVG	% OF AVG	(KAF)	AVG	% OF AVG
CLARK CANYON	5546.10	174,368	131,450	5534.83	5535.65	120,361	123,940	71	94	103	4.30	9.44	12.74	74	72	76	95
CANYON FERRY	3797.00	1,891,888	1,446,738	3787.28	3787.83	1,577,450	1,594,743	84	110	101	7.26	11.53	15.45	75	1,551	1,696	91
GIBSON	4724.00	98,687	59,697	4714.90	4706.83	86,873	76,957	78	129	89	5.52	4.96	13.66	36	258	407	63
PISHKUN	4370.00	46,694	998,877	4369.49	4368.52	45,921	44,469	95	4	97	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
WILLOW CREEK	4142.00	31,848	26,208	4141.25	4140.17	30,757	29,210	92	111	95	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
LAKE ELWELL	2993.00	925,649	738,239	2989.87	2982.91	869,956	761,049	82	103	87	6.90	6.20	15.38	40	223	370	60
SHERBURNE	4788.00	66,147	21,621	4782.65	4768.42	57,220	36,764	56	170	64	16.30	17.70	23.20	76	89	100	89
FRESNO	2575.00	91,746	69,308	2575.36	2574.68	93,622	90,106	98	130	96	0.00	0.00	0.50	0	N.A.	N.A.	N.A.
NELSON	2221.60	78,951	63,891	2221.33	2219.85	77,787	71,614	91	112	92	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
BIGHORN LAKE	3640.00	1,020,573	747,023	3621.24	3617.07	838,499	808,400	79	108	96	5.93	10.97	12.47	88	873	1,114	78

		Inflow		Elevation Change		Storage Change			Feet		River						
RESERVOIR NAME		Current	% of Avg	Last Week	Last Year	Last Week	Last Year		to Fill		Discharge						
CLARK CANYON		167	80	0.29	0.82	1,273	3,579		10.45			167					
CANYON FERRY		5,156	93	0.97	0.55	30,432	17,293		9.17			3,993					
GIBSON		1,647	113	2.73	-8.07	3,225	-9,916		17.17			202					
PISHKUN		1,012	N.A.	4.52	-0.97	6,481	-1,452		1.48			535					
WILLOW CREEK		79	N.A.	0.52	-1.08	736	-1,547		1.83			0					
LAKE ELWELL		884	67	0.58	-6.96	8,367	-108,907		10.09			520					
SHERBURNE		341	113	0.64	-14.23	786	-20,456		19.58			143					
FRESNO		507	80	1.62	-0.68	7,893	-3,516		0.32			49					
NELSON		470	N.A.	1.26	-1.48	5,030	-6,173		1.75			0					
BIGHORN LAKE		2,515	91	0.32	-4.17	2,182	-30,099		22.93			2,643					

Source: USBOR, "Highlights for March 2016": http://www.usbr.gov/gp/lakes_reservoirs/wareprts/mar.pdf

See:

- Montana Department of Natural Resources and Conservation (DNRC), Water Resources Division, State Water Projects Bureau: http://dnrc.mt.gov/divisions/water/projects
- BOR, Great Plains Region, Montana Lakes and Reservoirs: http://www.usbr.gov/gp/lakes_reservoirs/montana_lakes.html

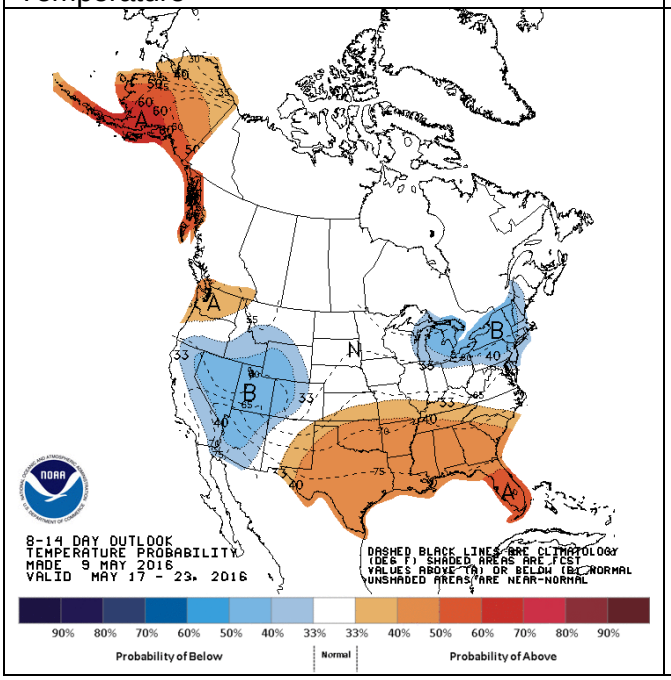
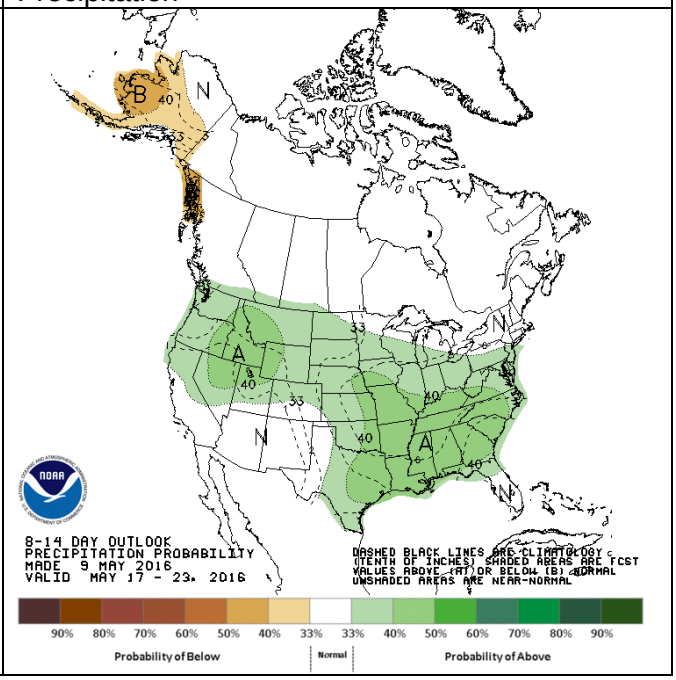
Climate Forecasts

Generally speaking, the climate and precipitation outlook for the coming months call for short-term increases in precipitation and a warming trend.

The next two weeks show normal temperatures for the state, with the exception of the southwestern portion where there is a 55% chance temperatures will be below normal. The outlook for precipitation across the state for the next two weeks indicates a 33-40% probability that

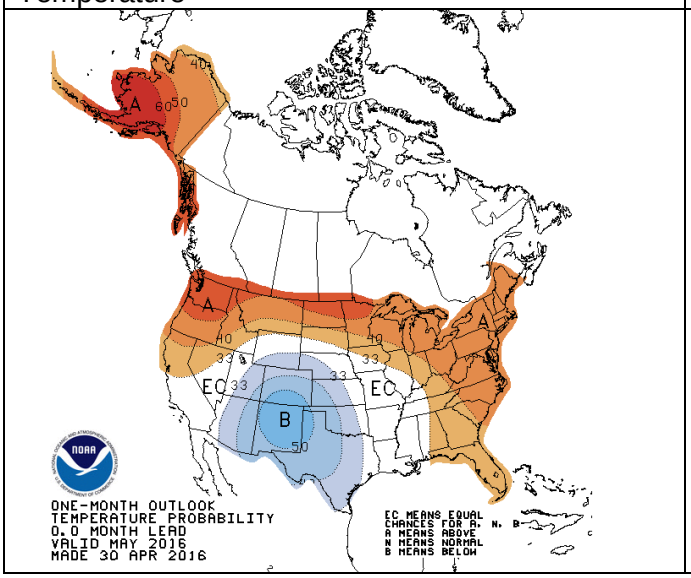
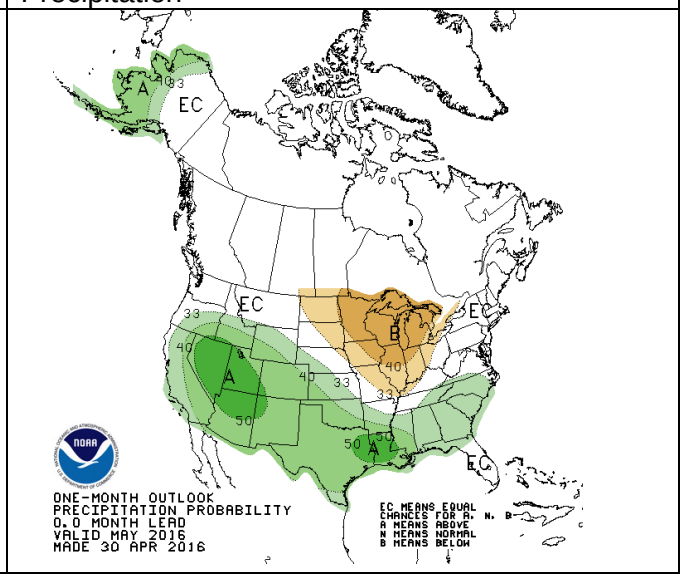
precipitation levels will be above normal for this time of year. The one-month outlook indicates a definite chance of above average temperatures and equal chances for above and below normal precipitation. The three-month outlook indicates warmer than normal temperatures and a 33% chance of above normal precipitation

2-Week Outlook

Temperature	Precipitation
	

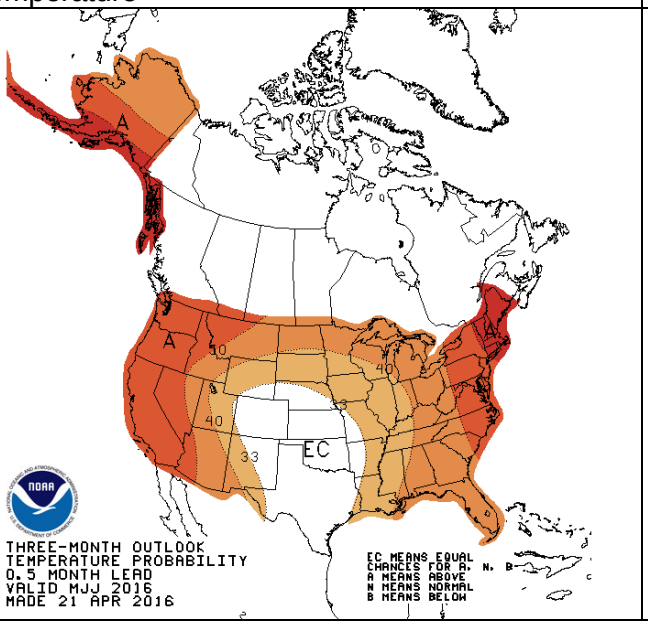
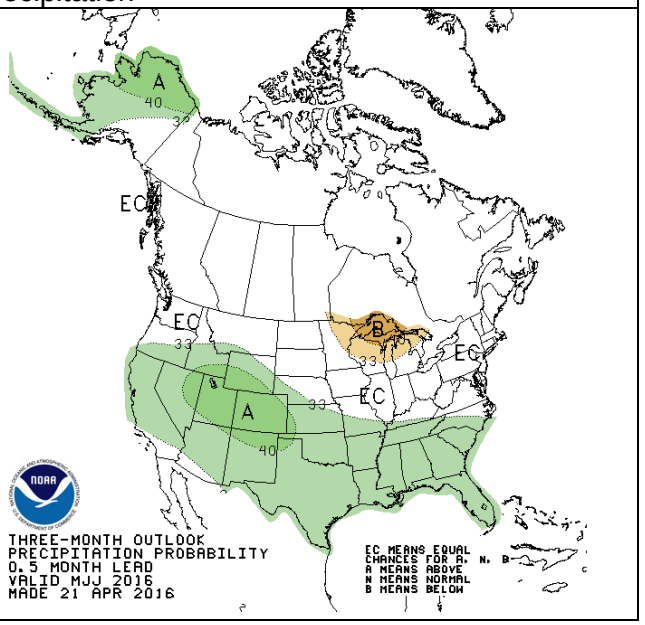
Source: NWS, Climate Prediction Center, 8-14 Day Outlook, Temperature and Precipitation (May 17, 2016 to May 23, 2016): http://www.cpc.ncep.noaa.gov/products/predictions/814day/

One-Month Outlook:

Temperature	Precipitation
	

Source: NWS, Climate Prediction Center, One-Month Outlooks, Official Forecasts, May 2016: http://www.cpc.ncep.noaa.gov/products/predictions/30day/

Three-Month Outlook:

Temperature	Precipitation
	

Source: NWS, Climate Prediction Center, Three-Month Outlooks, Official Forecasts: http://www.cpc.ncep.noaa.gov/products/predictions/90day/

See:

- NOAA, Climate Prediction Center: http://www.cpc.ncep.noaa.gov/products/predictions/814day/
- NOAA, Climate Prediction Center, One-Month to Three-Month Climate Outlook Maps and Graphs: http://www.cpc.ncep.noaa.gov/products/forecasts/month_to_season_outlooks.shtml

Crop Weather and Progress Report (NASS)

According to the May 8, 2016, USDA Agricultural Statistics Service Montana Crop Progress and Condition Report:

Montana was much drier and warmer with limited precipitation than the past several weeks throughout the state, according to the Mountain Regional Field Office of the National Agricultural Statistics Service, USDA. Thompson Falls received the highest amount of precipitation for the week with 0.36 of an inch of moisture. High temperatures ranged from the middle 70s to the lower 90s with a state wide high temperature of 91 degrees recorded at Plentywood. Potato producers began seeding ahead of last year, but behind the 5-year average with 11 percent seeded. Livestock producers were wrapping up calving and lambing as well as livestock feeding due to their herds being moved to summer ranges.

See:

- USDA, Montana Crop Progress: https://www.nass.usda.gov/Statistics_by_State/Montana/Publications/Crop_Progress_&_Condition/2016/MT_Crop_Progress_05012016.pdf

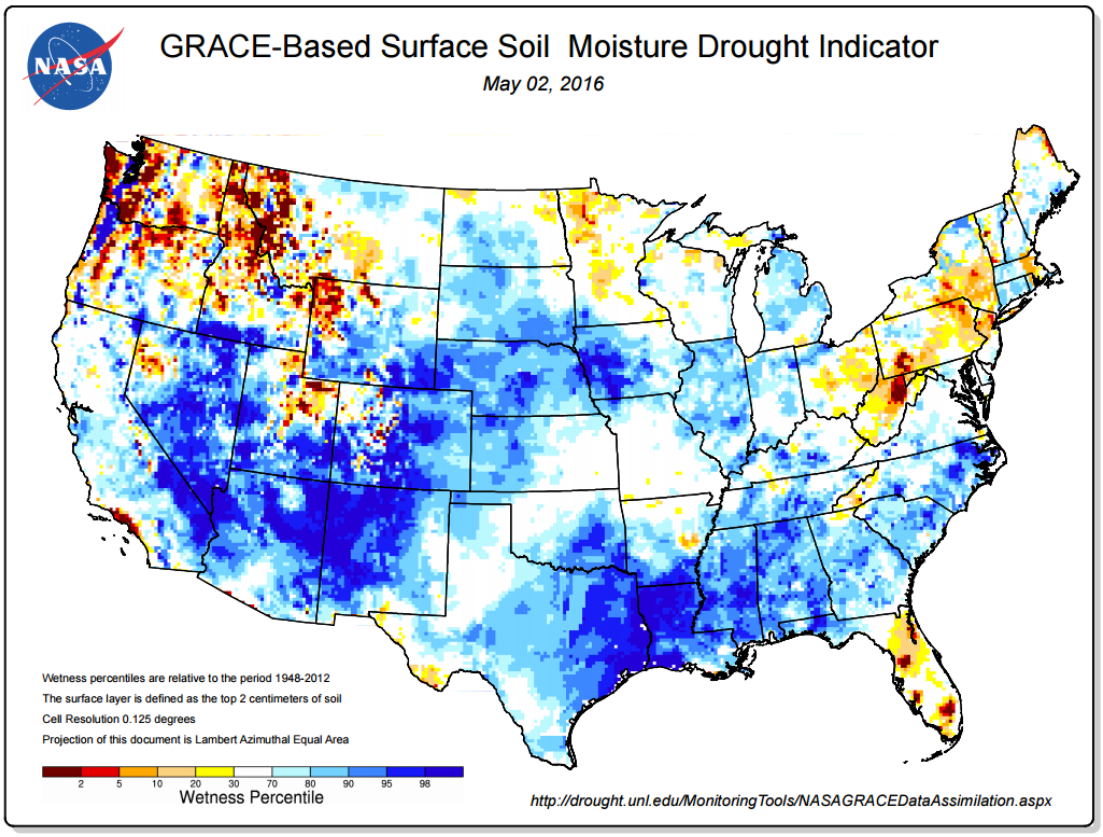
- USDA Weather Information for the Week ending 5/08/2016: https://www.nass.usda.gov/Statistics_by_State/Montana/Publications/Crop_Progress_&_Condition/2016/MT_Weather_05012016.pdf

Soil Moisture

According to the May1, 2016, USDA Agricultural Statistics Service Montana Crop Progress Report:

> The state has received moisture for the past several weeks that has improved both topsoil and subsoil moisture supplies. Topsoil moisture is rated 81 percent adequate and surplus compared with 58 percent last year and the 5 year average of 79 percent. Subsoil moisture is rated 68 percent adequate and surplus compared with 70 percent last year and the 5 year average of 76 percent.

Scientists at NASA's Goddard Space Flight Center generate groundwater and soil moisture drought indicators each week. They are based on terrestrial water storage observations derived from GRACE satellite data and integrated with other observations, using a sophisticated numerical model of land surface water and energy processes. The following map shows the wetness percentile for the entire country based on the relation of moisture in the top 2 cm of soil as compared to data for the same parameter collected from 1948-2012. The map echoes other data points shared in this report, indicating that soil moisture in the northwest, west and south central portions of the state are generally significantly lower than normal.



Source: National Drought Mitigation Center (NDMC), Groundwater and Soil Moisture Conditions from GRACE Data Assimilation: http://drought.unl.edu/MonitoringTools/NASAGRACEDataAssimilation.aspx

See:

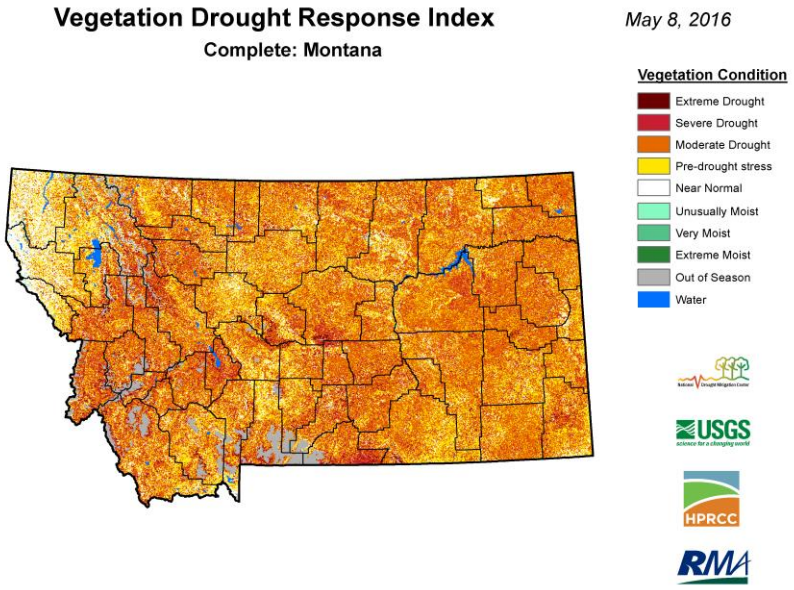
- USDA, National Agricultural Statistics Service, Montana Field Office, Crop Progress & Condition: https://www.nass.usda.gov/Statistics_by_State/Montana/Publications/Crop_Progress_&_Condition/
- National Drought Mitigation Center (NDMC), Groundwater and Soil Moisture Conditions from GRACE Data Assimilation: http://drought.unl.edu/MonitoringTools/NASAGRACEDataAssimilation.aspx

Vegetation Drought Response Index

The National Drought Mitigation Center (NDMC) produces VegDRI in collaboration with the USGS Center for Earth Resources Observation and Science (EROS), and the High Plains Regional Climate Center (HPRCC). VegDRI maps are produced every two weeks and provide regional to sub-county scale information about the effect of drought on vegetation.

The VegDRI calculations integrate satellite-based observations of vegetation conditions, climate data, and other biophysical information such as land cover/land use type, soil characteristics, and ecological setting. The VegDRI maps that are produced deliver continuous geographic coverage over large areas, and have inherently finer spatial detail (1-km2 resolution) than other commonly available drought indicators such as the U.S. Drought Monitor.

Montana is almost entirely characterized by severe to moderate drought according to the VegDRI for May 1, 2016, with the exception of the most northwestern corner of the state (see map below).



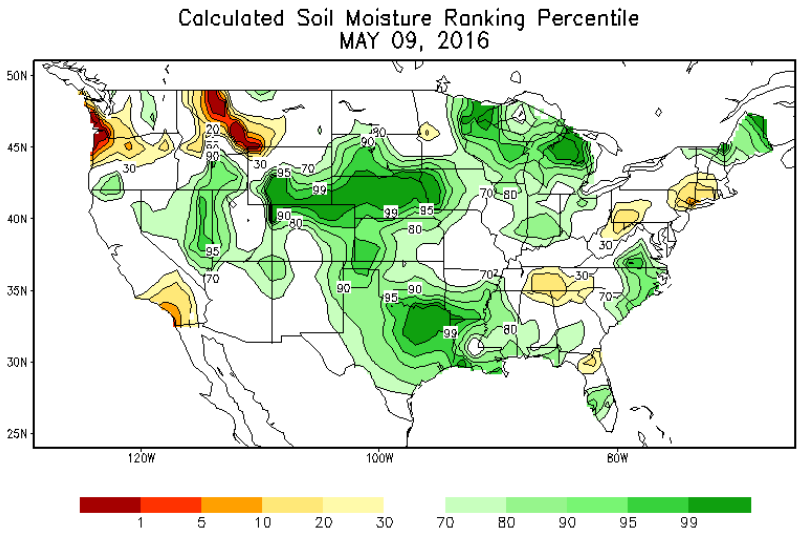
Source: National Drought Mitigation Center, Vegetation Drought Response Index, Montana, May 8, 2016: http://vegdri.unl.edu/Home/StateVegDRI.aspx?MT

See:

- Vegetation Drought Response Index: http://vegdri.unl.edu/

Soil Moisture Percentiles

The National Weather Service collects soil moisture data on a daily basis in order to provide information on wetness, anomalies, percentiles (based on 1932-2000) and monthly soil moisture climatology. The following map shows the percentile ranking for the country based on the last month's data. An area stretching from the Candaian border, along the Rocky Mountain Front to the state's border with Yellowstone National Park is in the range of the 1st to the 5th percentile below normal.



Source: NWS, Climate Prediction Center, Recent Anomalies, Calculated Soil Moisture Ranking Percentile, May 9, 2016: http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Summary_anom.shtml#

See:

- NOAA, Climate Prediction Center, Soil Moisture (mm): http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml
- NOAA, Climate Prediction Center, Soil Moisture Outlooks: http://www.cpc.ncep.noaa.gov/soilmst/forecasts.shtml
- http://www.drought.gov/drought/content/products-current-drought-and-monitoring-drought-indicators/soil-moisture

Climatology

The El Niño/Southern Oscillation (ENSO) is the name given to the weather phenomenon more commonly known as El Niño/La Niña. The positive (El Niño) and negative (La Niña) phases of ENSO affect Montana by bringing drier and warmer winters during El Niño years, and wetter and cooler winters during La Niña years. The impacts each phase creates during winter, such as high or low water content of mountain snowpack, have influence on water supply and soil moisture for the following crop season. NOAA's Climate Prediction Center's May 2016 forecast calls for an ENSO Alert System Status of an **El Niño Advisory/La Niña Watch**. This means Montana is likely to see a transition to ENSO-neutral weather during late Northern Hemisphere spring or early

summer 2016, with an increasing chance of La Niña during the second half of the year. As a result, weather patterns may to shift from warm and dry to cool and wet, generally speaking.

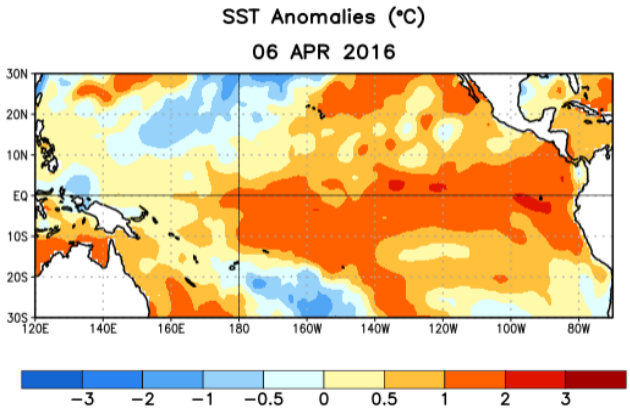


Figure 1. Average sea surface temperature (SST) anomalies (°C) for the week centered on 6 April 2016. Anomalies are computed with respect to the 1981-2010 base period weekly means.

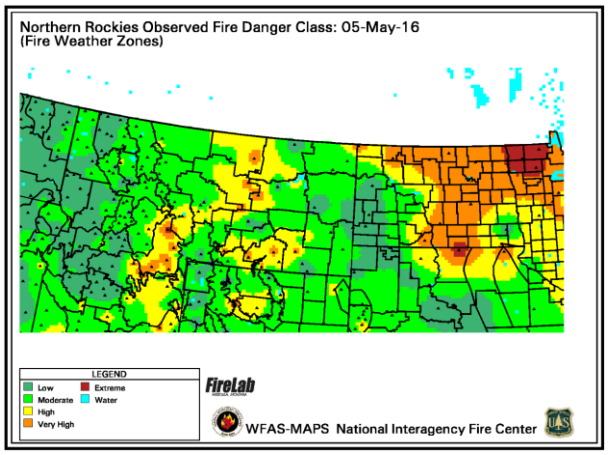
Source: NOAA, National Centers for Environmental Prediction, Climate Prediction Center, "El Niño/Southern Oscillation (ENSO) Diagnostic Discussion," issued by Climate Prediction Center/NCEP/NWS and the International Institute for Climate and Society, 14 April 2016: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.pdf

See:

- NOAA, Climate Prediction Center, El Niño/Southern Oscillation (ENSO) Diagnostic Discussion: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.pdf
- NOAA, NWS, Climate Prediction Center, El Niño – Southern Oscillation (ENSO): http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml
- ENSO Blog: http://www.climate.gov/news-features/blogs/enso/details-april-enso-forecast

Wildfire Season Outlook

The May 2016 observed fire danger for Montana appears to be consolidated in the southwest and central portions of the state, with very high fire danger in neighboring North Dakota (see map below).



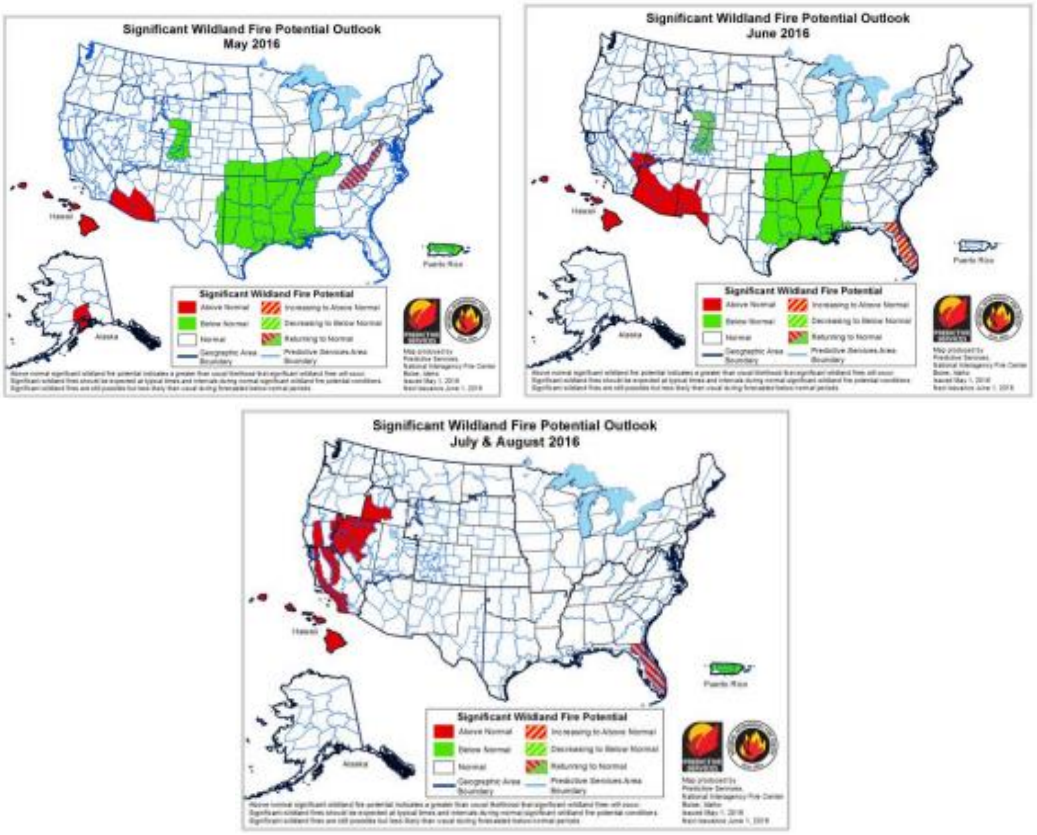
Source: Northern Rockies Coodination Center, Predictive Services, Fuels/Fire Danger, Northern Rockies Observed Fire Danger, May 5, 2016: http://www.wfas.net/images/firedanger/subsets/fdc_o_nr.png

As of May 1, 2016 officials of the Northern Rockies (Wildfire) Coordination Center (NRCC), in Missoula issued the Significant Wildland Fire Potential Outlook for the period of May, June, and July, and found that warm April weather had depleted mountain snowpack, but that, “the remaining snowpack should remain long enough for a normal to slightly delayed onset of higher elevation fire activity.” (NIFC, May 2016).

June through August Wildfire Outlook - Normal significant wildland fire potential is expected for the Northern Rockies Geographic Area for the Outlook period (see map below).

Due to continuing warm, dry conditions followed by abrupt shifts to cooler and wetter weather in April, Predictive Services and the National Interagency Fire Center (NIFC) anticipate a generally warmer and drier than average conditions with a transition to slightly wetter than average conditions for the mid-spring to early summer. The Report summarizes the fire season outlook for the Northern Rockies Region as follows:

> The first half of May will likely feature overall cooler and wetter than average conditions under the influence of a series of passing upper level troughs and low pressure areas. Two other potential transitions in the weather are likely throughout the period. The first of the two is expected in late May as the Area transitions to a convectively active southwesterly flow. By mid-July conditions will transition to a hot and dry ridge pattern. Greenup is currently occurring across the northern Rockies. Full green-up should occur by late May and early June in most areas followed by the curing and drying process of the live fuels from mid[-]June through July. The Northern Rockies is currently exiting the pre-green-up grassfire season east of the Continental Divide and largely remains out of season west of the Divide. Portions of the Area will begin fire season in late June as the grasses and other live fuels dry out across southeastern Montana and southwestern North Dakota. From there, a typical, gradual transition of the activity’s focus will shift from these areas to western Montana and northern Idaho by mid-July.



Source: Predictive Services and NIFC, National Significant Wildfire Potential Outlook: http://www.nifc.gov/nicc/predictive/outlooks/monthly_seasonal_outlook.pdf

See:

- Northern Rockies Coordination Center, Predictive Services: http://gacc.nifc.gov/nrcc/predictive/fuels_fire-danger/fuels_fire-danger.htm
- Predictive Services and NIFC, National Significant Wildfire Potential Outlook: http://www.nifc.gov/nicc/predictive/outlooks/monthly_seasonal_outlook.pdf

CONCLUSION

Taken as a whole, the data in this report show there is a moderate to strong potential for drought in the **Northern Rocky Mountain Front, southwest Flathead County, Sanders County, Mineral County, Carbon and Stillwater Counties, western Big Horn and Yellowstone Counties, and parts of Sweet Grass, Park, Golden Valley, and Musselshell Counties**.

The potential for flooding in the coming year is minimal due to early runoff and streamflows even during runoff at or below the 95th percentile. All conditions should continue to be closely monitored, as changes in precipitation are expected in early May - June.

The Governor's Drought and Water Supply Advisory Committee (DWSAC) will meet to discuss if the data provided merit additional activity, including issuing any **Drought Alerts** and **Severe Drought** status for areas of the state.

RESPONSES TO WATER SUPPLY AND MOISTURE CONDITIONS

Execution of the Montana Drought Response Plan (MDRP) has two levels defining what action is needed for below average moisture conditions, *Drought Alert* and *Severe Drought.*

See:

- Montana Drought Response Plan (1995): http://montanadma.org/sites/default/files/Volume%20X_Drought%20Plan.pdf

Drought Alert & State/Local Response

The MDRP indicates that the DAC can assign a *Drought Alert* status to a county if **by April 15** a river basin registers a **SWSI of -2.5 or less**, or a **PDSI value of -3.0 or less**, **and additional data**, such as current NWS (precipitation, forecasts, soil moisture) and USGS (streamflow) **confirm the SWSI or PDSI values for the preceding month** (MDRP, 1995). Counties with drought conditions prior to the preceding winter will be closely monitored for changes early in the season. During a *Drought Alert*, the state will take the following actions:

1) The DAC will request that the governor advise counties with a *Drought Alert* status to convene local drought advisory committees (LDACs) and communicate with the DAC regarding local conditions. This request is made by letter to county commissions and by press release.

2) The DAC will request state agencies to activate their plan annexes and prepare drought impact assessments. State agencies will present response strategies to the DAC in written form for the worst case scenario of worsening conditions.

3) DNRC prepares news releases, to be issued by the governor's office, summarizing conditions and explaining reasons for activation of LDACs.

4) The state library will issue water supply and/or moisture condition maps to the media for publication and broadcast.

5) The DAC staff will distribute information to LDACs, and county commissioners including materials to guide local drought management operations, and inform localities of available state and federal assistance.

6) The DAC considers increasing the frequency of meetings in response to the nature and rate of changes in drought conditions.

7) DNRC coordinates the preparation of assessment reports.

8) The DAC advises state and federal agencies to review reservoir operation plans and considers implementing appropriate drought contingency plans.

Severe Drought & State/Local Response

A county will be assigned a *Severe Drought* status if by **May 15** river basins reach a **SWSI of -3.5 or less**, **or** has a **PDSI of -4.0 or less**, **and the projected precipitation or water shortage is likely to create undue hardships for water uses and users**. During a *Severe Drought*, the state will take the following actions:

1) The DAC requests that the governor officially declare counties with DAC Severe Drought status a drought disaster.

2) The DAC will request that state agencies implement appropriate mitigation responses, based on current impact assessments in accordance with agency annexes to this plan.

3) DNRC will issue news releases through the governor's office explaining current drought conditions and recommended actions.

4) DES will contact local disaster services in counties with a Severe Drought status regarding federal disaster designation process.

5) DAC will increase the frequency of meetings with emphasis on assessment and response activities. The DAC will continue to monitor conditions, especially for significant changes.

6) On behalf of the governor, DES will facilitate the federal natural disaster determination process with state USDA officials and report progress to governor and DAC.

7) DEQ Water Quality Division will contact communities with a history of municipal water supply problems or discharge permit noncompliance to determine the extent of water quantity and quality and report these findings to DAC.

Funding and Programs

Federal Funding Programs: See Attachment A

State Funding Programs: See Attachment B

- National Drought Resilience Partnership (Montana has a pilot project in the Upper Missouri Watershed Basin to see how this program can create a template for communities wanting to create local drought management plans): https://www.drought.gov/drought/what-nidis/national-drought-resilience-partnership

State Water Rights

- Short-term lease that has a limited review process (MCA § 85-2-407): http://leg.mt.gov/bills/mca/85/2/85-2-407.htm)
- In-stream flow leasing: http://leg.mt.gov/bills/mca/85/2/85-2-436.htm

State Restrictions

- Angling restrictions: http://www.mtrules.org/gateway/Subchapterhome.asp?scn=12%2E5%2E5

State Information Resources

- The Montana State Library's Natural Resources Information System (NRIS): http://mslapps.mt.gov/Geographic_Information/Maps/watersupply/
- Governor's Drought and Water Supply Advisory Committee: http://drought.mt.gov

Governor's Drought and Water Supply Advisory Committee Meetings - 2016

The Committee will meet monthly May through October for the remainder of 2016.
All meetings are held from 9am – 12pm in Room 152 at the Montana State Capitol in Helena.
See: http://drought.mt.gov/Committee/Meetings.aspx

2016 DAC Meeting Schedule:

- May 19, 2016
- June 16, 2016
- July 14, 2016
- August 18, 2016
- September 15, 2016
- October 13, 2016

BIBLIOGRAPHY

1. NRCS, *May 1st 2016 Montana Water Supply Basin Outlook Report* (May 1, 2016): file:///C:/Users/cna130/Downloads/WSOR_May2016_Web.pdf
2. NRCS, *April 1st 2016 Montana Water Supply Basin Outlook Report* (April 1, 2016): file:///C:/Users/cna130/Downloads/WSOR_April2016%20(4).pdf.
3. NRCS, *April 1st 2015 Montana Water Supply Basin Outlook Report (April 1, 2015): file:///C:/Users/cna130/Downloads/May15.pdf.*
4. NOAA, *Missouri River basin Quarterly Climate Impacts and Outlook, September 2015. www.drought.gov/drought/content/resources/reports.*
5. NCDC, U.S. Selected Significant Climate Anomalies and Events August and Summer 2015 (2015): http://www.ncdc.noaa.gov/monitoring-content/sotc/national/2015/aug/monthlysigeventmap-082015.gif
6. NOAA, "Nearly 2.5 million acres burned across US in August 2015," (September 2015): https://www.climate.gov/news-features/featured-images/nearly-25-million-acres-burned-across-us-august-2015.
7. NOAA, MPAA, *Quarterly Climate Impacts and Outlook: Western Region March 2016*: file:///C:/Users/cna130/Downloads/noaawestdjf2016q1final.pdf
8. Montana Drought Response Plan (1995): http://montanadma.org/sites/default/files/Volume%20X_Drought%20Plan.pdf
9. USBOR, "Highlights for March 2016": http://www.usbr.gov/gp/lakes_reservoirs/wareprts/mar.pdf
10. USDA, Montana Crop Progress and Condition, Week Ending May 1, 2016: https://www.nass.usda.gov/Statistics_by_State/Montana/Publications/Crop_Progress_&_Condition/2016/MT_Crop_Progress_05012016.pdf

End